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Multi-Phase Pilot Test Technology Evaluation Report

**DRAFT** 

Ellsworth Air Force Base South Dakota

July 1996



Prepared for:

U.S. Army Corps of Engineers Omaha District

AGM01-01-0297

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# RADIAN

26 July 1996

10389 Old Placerville Road Sacramento, CA 95827 (916) 362-5332 FAX # (916) 362-2318

U.S. Army Corps of Engineers, Omaha District ATTN: CEMRO-ED-EB (Robert Zaruba) 215 North 17th Street Omaha, Nebraska 68102-4978

SUBJECT: Contract No. DACA45-93-D-0027, Delivery Order No. 27, Mods 04 and 05; Draft Ellsworth AFB Multi-Phase Pilot Test Technology

**Evaluation Report, BG-04 Site** 

Dear Mr. Zaruba:

Enclosed are seven (7) copies of the draft Ellsworth AFB Multi Phase Pilot Test Technical Evaluation Report performed at the BG-04 site per instructions from Ms. Kellie Kachek of the Omaha District. I have forwarded two copies to Ms. Margaret Calvert at ACC CES/ESVW, Langley AFB, six copies to Mr. Dell Petersen at Ellsworth AFB, one copy to Peter Ismert at EPA Region VIII, one copy to Mr. Ron Holm at the State of South Dakota, two copies to Mr. Keith Anderson at RUST, and one copy to Mr. Robert Todd at EA.

If you have any questions regarding this deliverable please contact me at (916) 857-7281 or Mr. Bill BuChans at (423) 483-9870.

Sincerely,

Francis E. Slavich, PE

Program Manager

c: Ms. Margaret Calvert, ACC CES/ESVW, Langley AFB (2)

Mr. Dell Petersen, Ellsworth AFB (6)

Mr. Peter Ismert, US EPA (1)

Mr. Ron Holm, SDDENR (1)

Mr. Keith Anderson, RUST (2)

Mr. Robert Todd, EA (1)

Bill BuChans, Radian (5)

James Machin, Radian (1)

Suzanne Sellers, Radian (1)

# ELLSWORTH AFB MULTI-PHASE PILOT TEST TECHNOLOGY EVALUATION REPORT FOR BG-04 SITE

Ellsworth Air Force Base South Dakota

### Prepared for:

U.S. Army Corps of Engineers Omaha District ATTN: CEMRO-ED-EB 215 North 17th Street Omaha, Nebraska 68102

### Prepared by:

Radian Corporation
1093 Commerce Park Drive, Suite 100
Oak Ridge, Tennessee 37830
Doc. #960716.1

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### **ACRONYMS**

ACC Air Combat Command

AFB Air Force Base

BGS Below Ground Surface

EA Engineering, Science, and Technology

EP U.S. Environmental Protection Agency

HQ Headquarters

HVDPE High-Vacuum Dual-Phase Extraction
LVDPE Low-Vacuum Dual Phase Extraction

MCL Maximum Contaminant Level

MPE Multi Phase Extraction

MW Monitoring Well
OU Operable Unit

PREECA Presumptive Remedy Engineering Evaluation/Cost Analysis

PVC Polyvinyl Chloride

RUST Rust Environmental and Infrastructure

TCE Trichloroethylene

TPE Two-Phase Extraction

USAF U.S. Air Force

VOA Volatile Organic Analysis
VOC Volatile Organic Compound

### 1.0 INTRODUCTION

In May 1996, Ellsworth Air Force Base (AFB), in Rapid City, South Dakota, and Radian Corporation (Radian) completed a seven-day pilot treatability test at the BG-04 site of Operable Unit-11 (OU) using Two-Phase Extraction (TPE), one of the Multi Phase Extraction (MPE) technologies. This report provides a summary of the methodology used during the test, the test results, and base-specific recommendations.

### 1.1 Purpose/Objectives

On 5 May 1995, Headquarters (HQ) Air Combat Command (ACC) published *United States Air* Force Presumptive Remedy Engineering Evaluation/Cost Analysis (PREECA) (U.S. Air Force [USAF], 1995) as a standardized decision framework specifying the criteria and associated decision logic necessary for implementing a nontime-critical removal action for various commonly used technologies. This decision framework, developed by Radian in conjunction with the U.S. Army Corps of Engineers and the USAF, combines the standard Comprehensive Environmental Response, Compensation, and Liability Act (CERLCA) nontime-critical removal action process with the concept of presumptive remedies and a "plug-in" logic tree approach. The result is a "generic" remedy selection document for all USAF installations that facilitates early and substantial risk reduction at USAF sites. PREECA applies only to a closely defined subset of conditions that the USAF has found to be common and that pose sufficient risk to justify nontime-critical removal actions. This methodology was not intended to be used at sites where the need for cleanup actions is not readily apparent.

In general PREECA focuses on remedies that can satisfy the majority of common USAF contamination situations, namely in situ bioventing, soil vapor extraction, groundwater containment, and capping. However, PREECA is intended to be updated as new, successful remedies are established. The USAF is

currently gathering extensive cost and performance data at a number of contaminated sites for addition of the multi-phase extraction technologies that include TPE, Low Vacuum Dual-Phase Extraction (LVDPE), and High Vacuum Dual-Phase Extraction (HVDPE). As part of this effort, HQ ACC has contracted with Radian through the Omaha District Corps of Engineers to evaluate the MPE technology for inclusion in the USAF PREECA. Radian, in conjunction with the USAF, developed an initial remedy profile for MPE as part of the PREECA effort.

This report presents the results of the TPE pilot test conducted at Ellsworth AFB in May 1996. It compares the pilot test results to the remedy profile for MPE technologies and demonstrates that TPE is an effective technology for use at Ellsworth AFB. In addition, it presents data on additional objectives for the pilot test, which were to:

- Demonstrate the contaminant removal effectiveness of the TPE technology;
- Determine the feasibility of installing a full-scale system;
- Collect sufficient engineering data to facilitate the design, installation, and operation of a full-scale extraction and treatment system; and
- Assist in the prevention of contaminant migration, thereby minimizing the threat of exposure to human health and the environment.

TPE was selected for testing at the BG-04 site because of the medium to low permeabilities of the soil at this site. The TPE technology is designed to enhance control of groundwater plumes in low- to moderate-permeability formations, as well as to remove contaminants from the saturated and vadose zones. Ellsworth AFB is in the process of implementing a time critical removal action at BG-04 that may consist of groundwater containment and/or

remediation. A large complement of information exists for the BG-04 site including the remedial investigation report [EA Engineering, Science, and Technology (EA), 1995] and the data from two recent studies (Rust Environmental and Infrastructure [RUST], 1995 and 1996).

### 1.2 Site Background

BG-04 is located in the northeastern portion of Ellsworth AFB as shown in Figure 1-1. This site is north of the housing area, and is in the vicinity of the site staging area used during the construction of the housing area. Previous field activities in the area have included installation and sampling of monitoring wells, water level measurements, aquifer testing, a seismic survey, and a direct push investigation. Data collected from these activities, in addition to data from this project, have been used to characterize the subsurface features and the nature and relative extent of contamination at the site.

#### 1.2.1 Subsurface Features

The BG-04 site is underlain by approximately 18 to 20 feet of soil (alluvium) that overlies weathered shale and shale bedrock of the Pierre Shale Formation (Figure 1-2). The overlying soil consists of interbedded clay, silt, sand and gravel. The clay, silt, and sand units are fine grained and have low to moderate permeabilities based on visual inspection. The gravel units are present at the base of the site soils and represent higher permeability materials. These basal gravels are sometimes present in paleochannels eroded into the bedrock surface in the BG-04 site. Other contractors have postulated that contaminant migration occurs primarily down these paleochannels (RUST, 1995).

The upper portion of the Pierre Shale is weathered and consists of variably fractured light olive gray to dark olive gray clay, which increases in competence with depth. Weathered shale is at least 13 feet thick in the study area (work in the area of the BG-04 plume did not

delineate the depth at which competent shale is encountered). The permeability of the weathered and fractured shale is likely to be low.

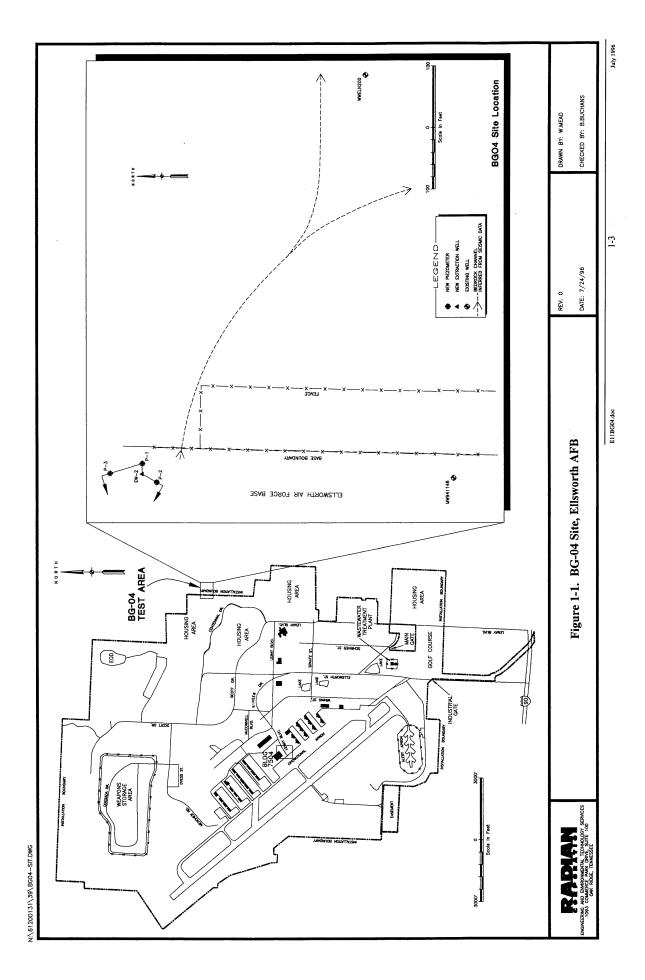
Extraction well EW-2 was completed primarily within the overlying alluvium and a couple of feet into the weathered shale bedrock and was screened from 13 to 23 feet below ground surface (BGS). Depth to groundwater in the well was 14 feet BGS. The saturated alluvial thickness ranged from 4 to 6 feet in the extraction well and adjacent piezometers (P-1, P-2, and P-3).

Data from slug tests conducted by EA indicate the geometric mean hydraulic conductivity for the shallow aquifer at Ellsworth AFB is  $1.1 \times$ 1.0<sup>-4</sup> centimeters per second (cm/s). Figure 1-3 shows the distribution of hydraulic conductivities for the saturated zone across the base. These slug tests were conducted on numerous wells in various parts of the Base. Most wells are screened across the entire saturated zone of the shallow aquifer. This aquifer is quite variable across the Base and consists of heterogeneous mixtures of alluvial material (clay, silt, sand, gravel) and/or fractured shale. This results in the rather large spread of hydraulic conductivities as shown in Figure 1-3.

Hydraulic conductivities were measured in the BG-04 test area by a slug test in EW-2 and a recovery test in P-1 and were  $1.3 \times 10^{-3}$  and  $2.1 \times 10^{-2}$  cm/s, respectively. These values, although variable, are consistent with the range of values measured elsewhere on the Base. This variability is indicative of the heterogeneous nature of the deposits at the site.

Groundwater flow direction is generally to the southeast in the BG-04 plume area; however, site-specific data were not yet available in the test area as of the preparation of this report.

#### 1.2.2 Nature and Extent of Contamination



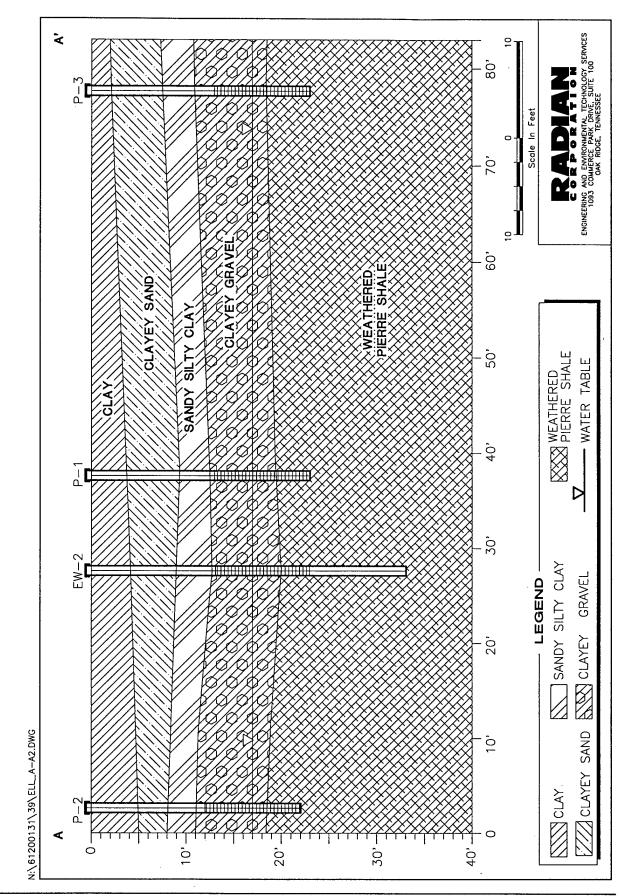
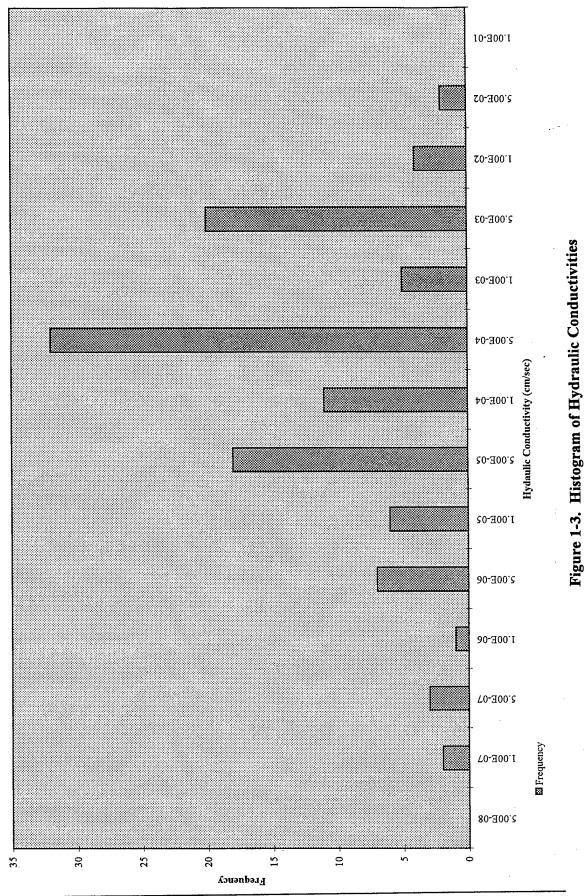


Figure 1-2. BG-04 Conceptual Cross-Section



Analysis of groundwater from monitoring well MW941148 (the closest existing monitoring well to the test area) showed the only organic contaminants detected were VOCs; metals were in a range consistent with acceptable background concentrations. Trichloroethylene (TCE) was the only contaminant (23 micrograms per liter [µg/L]) identified at this site.

The direct push investigation yielded 31 groundwater samples along and east of the base boundary. Most samples were analyzed by a mobile laboratory. The results revealed TCE in excess of 5  $\mu$ g/L at 13 locations. The highest TCE concentration was 1,068  $\mu$ g/L immediately north of water well ELN200 and about 600 feet east-northeast of MW941148. Other high concentrations (up to 227  $\mu$ g/L) were detected north of MW941148 along the eastern base boundary in the vicinity of the site of this test.

Samples collected from EW-2 during this test indicated TCE concentrations of 36 to 45  $\mu g/L$ .

### 2.0 TPE EXTRACTION TEST METHODOLOGY

The following information on the technical approach and the sampling and analytical methodologies is a summary of the *Ellsworth AFB OU-11*, *Vacuum Enhanced TPE Pilot Test Work Plan* (Radian, 1996). Additional details are contained in that document.

#### 2.1 Test Procedures

The pilot-scale test of the TPE system consisted of a seven-day test conducted in the BG-04 plume on a new extraction well (EW-2) on the eastern base boundary. The test was completed 25 May 1996.

The locations of the test wells and monitoring points are shown in Figure 2-1. Well and piezometer characteristics are summarized in Table 2-1. Well logs are included in Appendix A.

### 2.1.1 Installation of Extraction Well and Piezometers

#### 2.1.1.1 Extraction Well

The extraction well (EW-2) was installed in order to test TPE for the removal of TCE from groundwater from the BG-04 plume. The location was selected based upon limited data from previous direct push and seismic refraction data in the area. Well placement was planned to be within a bedrock paleochannel referred from the seismic refraction study in an area of elevated TCE concentrations.

The well was installed on 14 and 15 May 1996 using a hollow stem auger drilling rig with 10-inch outside diameter augers. Soil samples were collected continuously so that a lithologic log could be prepared (Appendix A). Samples were also collected for field headspace screening using a photoionization detector. The well was constructed with 4-inch diameter polyvinyl chloride (PVC) well casing and screen. The well casing, sand pack, and bentonite seal were

installed through the augers to ensure the stability of the well bore. The well screen was placed in the upper portion of weathered shale and across the entire saturated section of alluvial deposits. The 10-foot long screen was placed from 13 to 23 feet below ground surface (BGS) with an additional 10 feet of blank casing from 23 to 33 feet BGS. A lithologic log and completion detail are contained in Appendix A.

Data from soil samples collected from EW-2 and the adjacent piezometers indicate that, if present, the paleochannel is only 1 to 2 feet lower in elevation than the surrounding weathered Pierre Shale bedrock.

After the well was completed, it was developed to remove silt and clay and ensure communication with the aguifer. The well was first surged with a 4-inch, vented, surge block to loosen up the fine material from the sand pack so that it could be removed. The well was then purged using a disposable bailer and down-hole submersible pump. Water quality was monitored during development by visually observing the silt and clay content of the water and by pH and turbidity measurements. Development was judged complete when the pH was stable and turbidity of the water had decreased to the satisfaction of the supervising geologist. Development logs are contained in Appendix A.

Prior to beginning the TPE test, a simplified step test was run on 16 May 1996 to estimate the flow rate that could be expected from the well. EW-2 was pumped with a down-hole submersible pump at flow rates of approximately 1, 2, 4.5, and 9.6 gallons per minute (gpm). Each step was run for a few minutes until the water level in the well stabilized or the well pumped dry. During this short duration test, the well was able to sustain a rate of approximately 4.5 gpm with the water level at the base of the screen.

### 2.1.1.2 Piezometers

The piezometers (P-1, P-2, and P-3) were installed in order to monitor the response of the aquifer to the test. Piezometers were located at distances of 10, 25, and 50 feet from extraction well EW-2. The locations were chosen such that data could be collected on the response of the saturated and unsaturated (vadose) zones to TPE. Well screens were placed in the upper portion of weathered shale and across the entire saturated

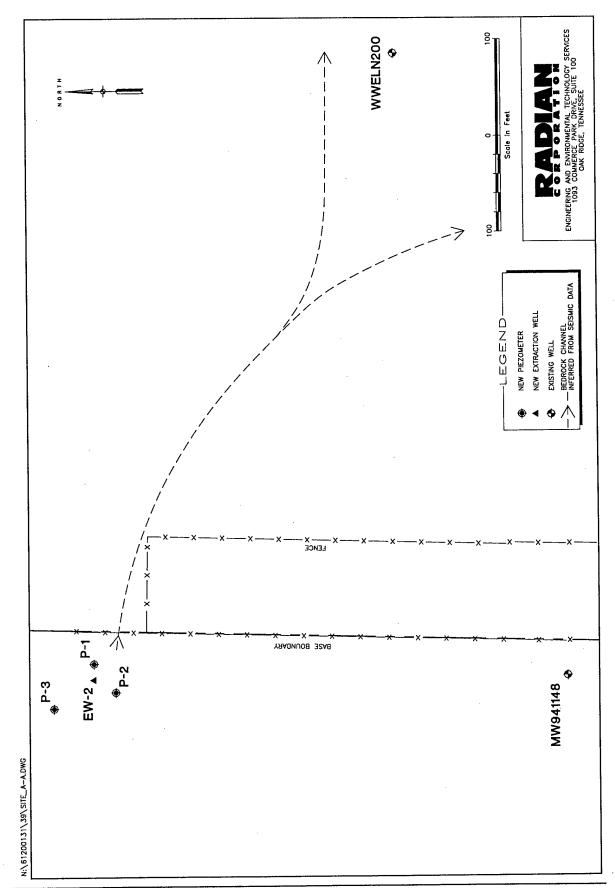


Figure 2-1. BG-04, Test Well and Monitoring Points, Ellsworth AFB

Table 2-1
Summary of Wells and Monitoring Point Characteristics

Well/ Piezometer ID	Used to Monitor	Total Depth (ft BGS)	Screened Interval (ft BGS)	Approximate Distance from EW-2 (ft)
P-1	Water Level/Induced Vacuum	23	13-23	10
P-2	Water Level/Induced Vacuum	23	12-22	25
P-3	Water Level/Induced Vacuum	23	13-23	50
EW-2	Extraction Well	33	13-23	0
MW941148	Monitoring Well	22	11-21	500

BGS = Below Ground Surface

section of alluvial deposits. The screens also extended several feet up into the unsaturated zone. This type of completion allows both water level drawdown in the aquifer and induced air vacuum in the vadose zone to be measured in the same well. Figure 2-1 shows the locations of the well and piezometers.

The piezometers were installed on 15 May 1996 using a hollow stem auger drilling rig with 6inch outside diameter augers. Soil samples were collected from selected intervals in P-2 and P-3 so that lithologic logs could be prepared and for headspace screening (Appendix A). Soil samples were not collected from P-1 due to its proximity (10 feet) to EW-2. The piezometers were constructed with 2-inch diameter (PVC) well casing and screen. The well casing, sand pack, and bentonite seal were installed through the augers to ensure the stability of the well bore. The details of the wells are contained in the completion logs in Appendix A. In general, 10-feet long screens were placed within the weathered Pierre Shale at a depth of 13 to 23 feet below the ground surface.

After the piezometers were completed, they were developed to remove silt and clay and ensure communication with the aquifer. The wells were first surged with a 2-inch, vented, surged block to loosen up the fine material from the sand pack so that it could be removed. The piezometers were then developed in the same manner as the extraction well. Development logs are contained in Appendix A.

### 2.1.2 Test Equipment

The test was conducted using a trailer-mounted, 25-horsepower, high-vacuum extraction unit capable of producing an air flow rate of 300 cubic feet per minute (acfm) at 25 inches mercury. The system is shown in schematic in Figure 2-2. Extracted groundwater was discharged to temporary storage tanks; extracted vapor was discharged to the atmosphere. The wastewater was transported and discharged to the OU-1 treatment plant. Procedures followed during the testing are summarized in the work plan described in Section 2.0.

# 2.2 Sampling and Analytical Methodologies

All sampling and analytical procedures (except where noted) were conducted in accordance with procedures and protocols described in the U.S. Environmental Protection Agency (EPA)-approved Ellsworth AFB Quality Assurance Project Plan. Sampling locations and frequency are summarized in Table 2-2.

### 2.2.1 Sampling Methodology

System parameters and ambient air conditions were measured with various vacuum gauges, meters, and thermometers included on the mobile trailer. Groundwater drawdown in the observation wells was measured using an electronic water level meter, and induced vacuum

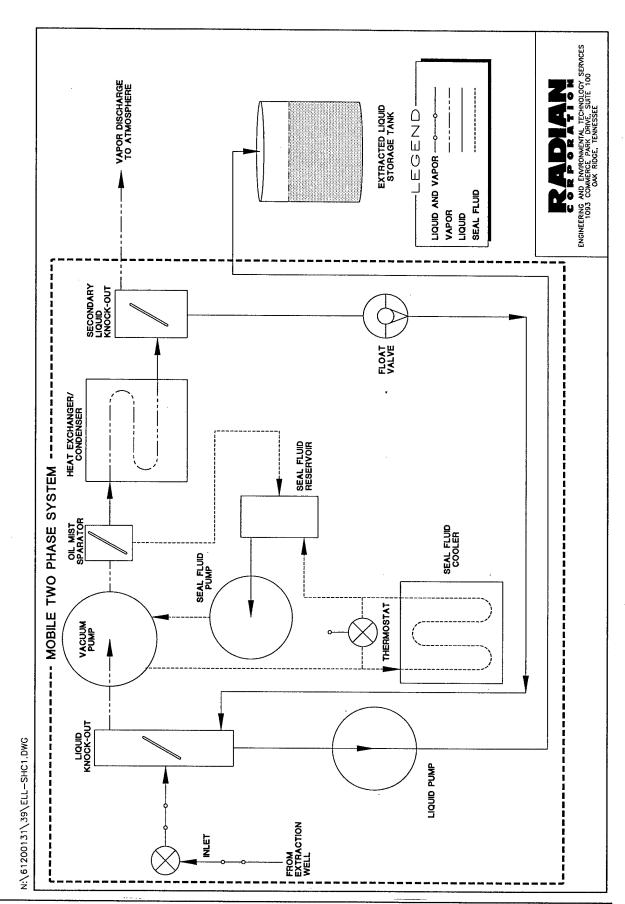


Figure 2-2. TPE System Schematic

was measured using Magnehelic gauges. Data collected were recorded on field data tables (Appendix B).

Baseline groundwater samples from EW-2 were collected prior to TPE testing in 40-milliliter (mL) volatile organic analysis (VOA) vials using a dedicated Teflon<sup>®</sup> bailer. Prior to collecting the baseline samples, three well volumes of water were purged from the well. Approximately one hour after ending the test, post-test groundwater samples were collected using the dedicated bailer.

Water samples collected during the test were taken directly from the TPE trailer knock-out pot with VOA vials. All VOA vials were iced and stored in a dedicated cooler until shipped to Energy Laboratories, Inc., in Rapid City, South Dakota.

Vapor samples were collected using disposable syringes and evacuated vials provided by Microseeps Inc., Pittsburgh, Pennsylvania. Once the samples were collected, they were stored at ambient conditions until shipped to the Microseeps laboratory for analysis.

Quality control samples were also collected in the field. Duplicate water and vapor samples were collected at a 10% frequency by the methods previously described. Trip blanks accompanied the VOA vials throughout shipping and handling.

### 2.2.2 Analytical Methodology

Groundwater samples were analyzed for VOCs by EPA Method SW 8260. Soil vapor samples were analyzed for VOCs by Microseeps Analytical Method AM 4.03.

Table 2-2

Frequency of Sample Collection and Source Monitoring

	Water Samples from Knock-Out Pot			X			×	×	X			×		×				×				×			X		×	×		X		X		X	
	System Parameters		×		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×		×	×	×	X	Х	X	×	×	X	Х	X	X	Х	X	
	Induced Vacuum at Soil Vapor Monitoring Probes		×		×	×	×	×	X	×	×	×	×	×	×	×	×	×	×		X	×	×	X	X	X	×	×	X	X	X	X	X	X	
	Effluent Vapor Samples		×	×			×	×	×			×		×								×			X		×	×		X		X		X	
Schedule	Water Levels at Groundwater Piezometers	Г	×		×	×	×	×	×	×	×	×	×	X	×	X	×	×	×	X	X	×	X	X	X	Х	×	X	X	Х	X	Х	X	X	X
	Groundwater Sample from Test Well	×																																	Х
	Measure Water Level at Test 9	×																																	×
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Note: Groundwater/water samples analyzed for VOCs by Method SW-8260. Vapor samples analyzed for VOCs by Microseeps Analytical Method AM 4.03.

## 3.0 TEST RESULTS AND CONCLUSIONS

A critical step toward adding another presumptive remedy to the PREECA process is to compare that remedial technology's test results, referred to here as the "site-specific profile," to its PREECA remedy profile and determine the extent to which the two profiles match. The remedy profile comprises the performance data (including site selection criteria, process and methodology descriptions, and the acceptable range of quantitative results) by which the effectiveness of the presumptive remedy will be judged.

Radian performed a seven-day test on the EW-2 well at the BG-04 site. Table 3-1 summarizes the results achieved using the TPE system at the EW-2 well. The results of this test are described in Section 3.4.

Table 3-1
Summary of Results

System Parameter	EW-2
Groundwater Extraction Rate	2-3 gpm
Soil Vapor Extraction Rate	15-30 scfm
Contaminant Removal Rate	0.003 lb/day
Radius of Influence (Groundwater)	>70 ft

gpm = gallons per minute scfm = standard cubic feet per minute

Based on the results of the pilot-scale TPE test conducted at Ellsworth AFB BG-04, Radian has constructed a site-specific profile for BG-04. A comparison of this site-specific profile to the general MPE profile and the specific TPE, LVDPE, and HVDPE profiles are presented in Tables 3-2 and 3-3. Note that the BG-04 profile falls within the general MPE profile and compares favorably with the corresponding TPE remedy profile.

### 3.1 System Operation

Physical and analytical data were analyzed to determine the following:

- Baseline VOC concentrations in groundwater;
- The major VOC constituents in the vapor and water streams;
- Average groundwater and soil vapor extraction rates;
- Average VOC extraction rates and total pounds of VOCs removed;
- The relationship between time and VOC concentrations;
- The relationship between time and vapor and water flow rates; and
- The relationship between distance and groundwater drawdown and induced vacuum, including radi of influence.

# 3.2 Radii of Influence and Production Rates

The following sections describe groundwater and vapor production rates and radiis of influence.

#### 3.2.1 Groundwater

The groundwater flow rate was measured using a totalizing flow water meter and is plotted along with the vapor flow rate on Figure 3-1. Water table drawdown was measured in piezometers P-1, P-2, and P-3 (Appendix B). A plot of drawdown vs time is presented in Figure 3-2. A plot of drawdown vs distance at the end of the BG-04 test is presented in Figure 3-3.

Table 3-2
MPE Technology Selection Criteria for BG-04

Criteria Parameter	BG-04 Site	Guideline
Contaminant	TCE	Halogenated VOCs, and non-
		halogenated VOCs and TPH for sites
		where expedited action is required
Contamination location	Saturated zone	Saturated zone alone or saturated and
		vadose zones combined
Contaminant concentration	36-45 μg/L	Significantly greater than MCLs
		$MCL = 5.0 \mu g/L$
Henry's Law Constant of majority of contaminants	0.297 at 20 C°	> 0.01 at 20 C° (dimensionless) <sup>1</sup>
Vapor pressure of majority of contaminants	58 mm Hg at 20 C°	> 1.0 mm Hg at 20 C°
Lithology of saturated zone	Clayey-gravel and weathered Pierre Shale	Sands to Clays
Natural groundwater production rate	Est. approximately 2 gpm	No limitations
Depth of contamination in vadose	N/A	> 5 feet BGS (MPE not applicable < 5
zone (if targeted)		feet BGS)
Average air permeability of vadose	N/A	Low permeability (< 1 x 10 <sup>-3</sup> ) and
zone (if targeted)		moderate permeability (between 1 x
		10 <sup>-3</sup> darcy and 0.1 darcy) soils.

<sup>&</sup>lt;sup>1</sup> Dimensionless Henry's Law Constant in the form: (concentration in gas phase) / (concentration in liquid phase)

BGS = Below Ground Surface

Hg = Mercury

MCL = Maximum Contaminant Level

mm = Millimeter

MPE = Multi Phase Extraction

N/A = Not applicable TCE = Trichlorethylene

TPH = Total Petroleum Hydrocarbon VOC = Volatile Organic Compound

Table 3-3 LVDPE, HVDPE, and HVTPE Technology Selection Criteria for BG-04

Criteria Parameter	BG-04 Site	LVDPE Guideline	HVDPE Guideline	Guideline HVTPE
Groundwater production rate <sup>1</sup>	2.2 gpm (under vacuum )	> 2 gpm <sup>2</sup>	no limitations	< 5 gpm
Depth of targeted contamination	> 18-23 feet BGS	no limitations	no limitations	up to 50 BGS ± (for groundwater production < 1 gpm)  up to 20-30 BGS (for groundwater production = 5 gpm)
Lithology of saturated zone	clayey gravel and weathered shale	sands to silty sands	sandy silts to clays	sandy silts to clays
Average air permeability of vadose zone (if targeted)	N/A - not targeted	moderate permeability (between 1 x 10 <sup>-3</sup> darcy and 0.1 darcy)	low permeability (less than 1 x 10 <sup>-3</sup> darcy)	low permeability (less than 1 x 10 <sup>-3</sup> darcy)

BGS = Below Ground Surface

gpm = Gallons per minute
N/A = Not applicable

<sup>&</sup>lt;sup>1</sup> For MPE, the aquifer must be able to be dewatered.
<sup>2</sup> For flows < 2 gpm, pneumatic pumps may be used in place of submersible pumps

Figure 3.1 BG-04 Vapor and Liquid Flow Rates

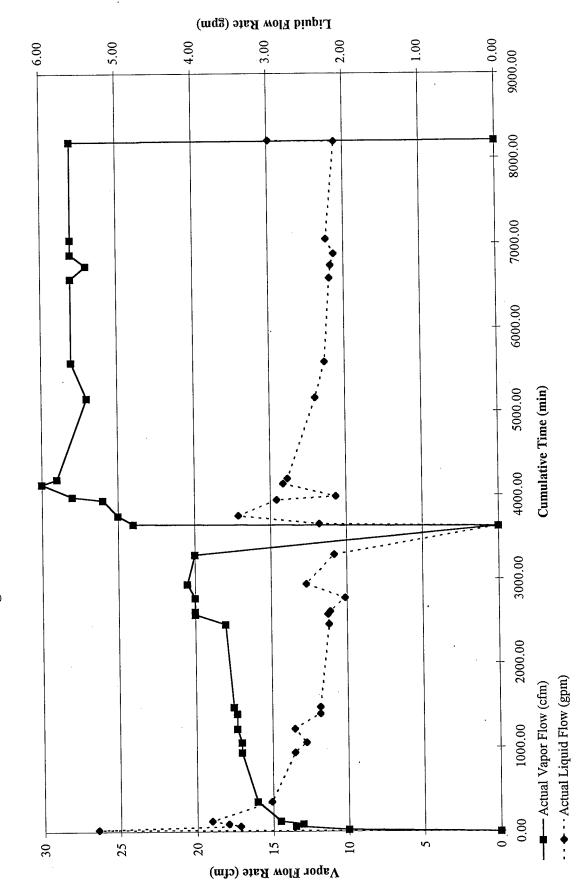
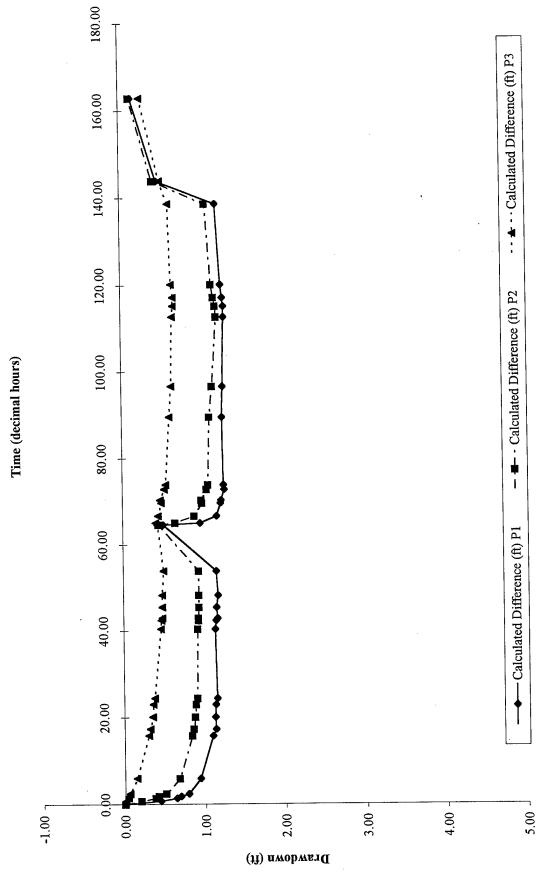
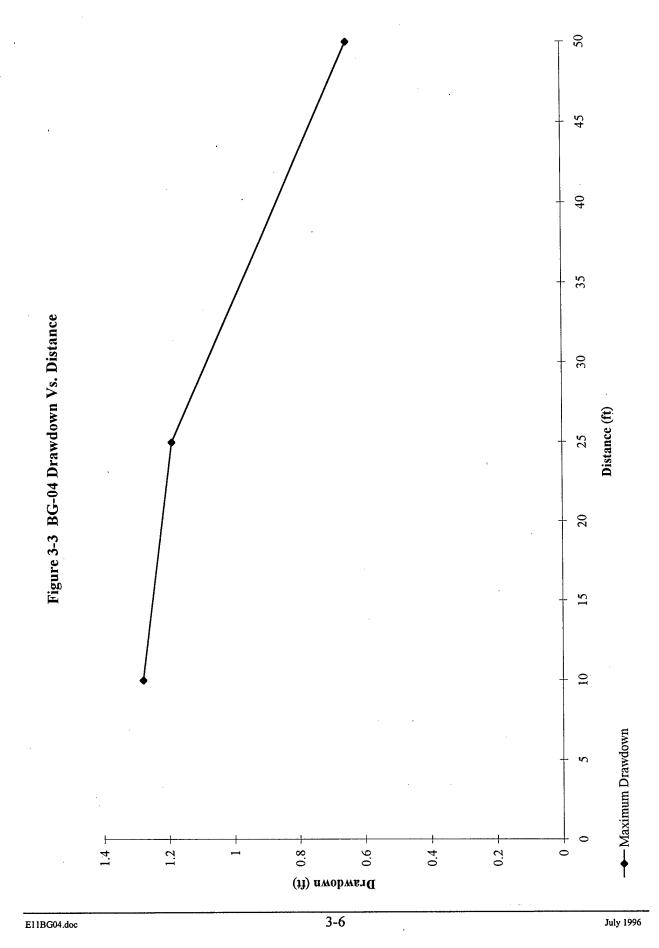


Figure 3.2 BG-04 Water Level Drawdown Over Time





During the BG-04 test, the groundwater flow rate surged at the beginning of the test due to evacuation of the well and sand pack, as well as from dewatering of the sand and gravel deposits near the well. After the initial surge, the water production rate fell slowly before stabilizing at approximately 2.2 gpm (Figure 3-1). The maximum radius of influence (defined as 0.1 feet of drawdown) is estimated to be approximately 70 feet based on the available data.

### 3.2.2 Vapor

The vapor flow rate was measured using rotameters located at the skid and is plotted along with the vapor flow rate on Figure 3-1. Induced vacuum was measured in piezometers P-1, P-2, and P-3 (Appendix B). A plot of the induced vacuum vs distance at the end of the BG-04 test is presented in Figure 3-4.

During the BG-04 test, vapor flow steadily increased during the first 80 hours of the test. During the latter portion of the test the flow rate stabilized at approximately 27 standard cubic feet per minutes (scfm). The increase in flow during the first 80 hours of the test occurred as the formation was dewatered and the relative permeability to vapor increased.

The radius of influence of the vapor is greater than 50 feet based on the available data. Significant vacuums were measured in the adjacent piezometers with values between 3.7 and 8.6 inches of water at the end of the test.

### 3.3 **VOC Recovery**

Table 3-4 summarizes analytical results for the VOCs detected in the samples collected during the test. TCE was the only contaminant found at the site (see Appendices C and D for the analytical laboratory results and chain-of-custody forms). Results of VOC sampling at EW-2 included:

- The baseline concentration (pre- test) of TCE in groundwater from EW-2 was 45 μg/L;
- The post-test concentration of TCE was 36 μg/L;
- The TCE concentration in the extracted water (collected from knock-out pot) averaged 2.4 μg/L. All samples contained less than the maximum contaminant level (MCL) of TCE (5.0 μg/L); and
- The TCE concentration in extracted vapor averaged 0.28 parts per million by volume (ppmv).

#### 3.3.1 Extraction Results

Results of the BG-04 test included:

- Approximately 0.016 pounds of TCE was extracted from EW-2 in 162 hours of testing. The vast majority of the mass was extracted in the vapor phase.
- Average groundwater extraction rate was 2.4 gpm. Approximately 19,466 gallons of contaminated groundwater were extracted.
- Average vapor extraction rate from the formation was 20.7 scfm.
- The TPE extraction system transferred over 95% of the VOCs in the groundwater to the vapor phase, resulting in decreased concentrations in the water phase and reduced treatment cost.

#### 3.3.2 VOC Removal Over Time

The graph showing VOC removal over time at the test well is provided in Figure 3-5. In general, steady concentrations in both extracted vapor and water were achieved after approximately 20 hours of testing.

Ninety-eight percent of the total VOCs removed were from the vapor phase and the remaining 2

percent were in the water phase. Much of this mass was stripped from the groundwater, but some was volatilized from the sediments as the formation dewatered.

# 3.3.3 Two Phase Extraction vs Pump and Treat Comparison

A comparison of mass removal rates over time was made between groundwater pump and treat and TPE. The comparison estimated pumping 19,466 gallons of groundwater (the volume removed during this test) with an average contaminant concentration of 40.5  $\mu$ g/L of TCE (the average of the per- and post-test samples). The mass contained in this volume of water was compared to the measured mass extracted during the TPE test. This comparison shows that TPE would extract 2.4 times the amount of mass over pump and treat. These calculations are presented in Appendix E.

3-8

50 45 40 35 30 Distance (ft) 25 20 15 10 --- Maximum Vacuum Vacuum (inches water)

Figure 3-4 BG-04 Induced Vacuum Vs. Distance

Table 3-4

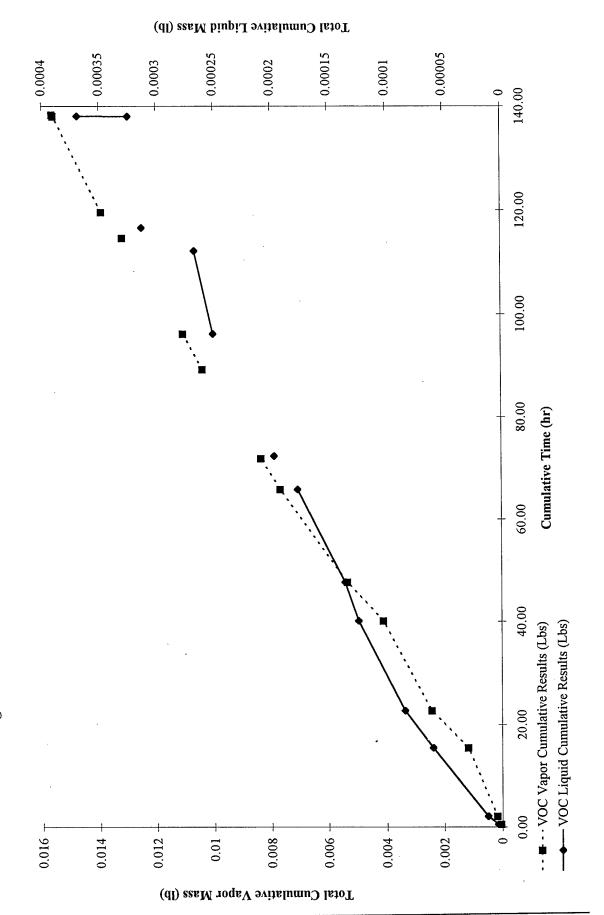
Summary of Vapor and Water Data

Concentrations in Micrograms per Liter (µg/L) - Water and

Parts per Million by Volume (ppmv) - Vapor

Extracted W	ater Concentration	Extracted Vapor Concentration							
Sample ID	Trichloroethylene	Sample ID	Trichloroethylene						
EW-2 Pre-Test	45	<b>V</b> 1	0.366						
Effluent-1	3.3	V2	0.315						
Effluent-2	2.9	V3	0.222						
Effluent-3	2.5	V4	0.492						
Effluent-4	2.5	V5	0.267						
Effluent-5	2.0	V6	0.400						
Effluent-6	2.0	.V7	0.386						
Effluent-7 (Dup)	2.5	V7Dup	0.306						
Effluent-7D	2.5	V8	0.205						
Effluent-8	2.5	V9	0.201						
Effluent-9	2.2	V10	0.171						
Effluent-10	2.0	V11	0.202						
Effluent-11	2.2	V12	0.257						
Effluent-12	2.1	V13	0.160						
Effluent-13	2.2								
EW-2 Post-Test	36								

Figure 3-5. BG-04 Total Mass of VOCs Removed Over Time (water and Vapor)



### 3.4 Conclusions

### 3.4.1 Hydrogeologic Conclusions

A sustained flow rate of approximately 2.2 gpm and was generated during the TPE test. Most of the water production is believed to have been from moderately permeable saturated alluvium consisting of a heterogeneous mixture of clay, silt, sand, and gravel overlying weathered Pierre Shale bedrock. Hydraulic conductivities were measured in the BG-04 test area by a slug test in EW-2 and a recovery test in P-1 and were 1.3 x 10<sup>-3</sup> and 2.1 x 10<sup>-2</sup> centimeters per second (cm/s), respectively. This variability is consistent with the nature of the deposits at the site. These values are also consistent with hydraulic conductivities measured elsewhere on the Base, as shown in Figure 1-3.

Sustained flow rates from the TPE test (2.2 gpm) under a well head residual vacuum of 12 in of mercury were less than those achieved from the short duration step-rate pumping test (4.5 gpm). This is because the longer duration TPE test began dewatering portions of the saturated zone and the higher well yields could not be sustained. At a distance of 25 feet, the saturated thickness in P-2 decreased by approximately 25% during the test period.

A stabilized vapor flow rate of approximately 27 scfm was developed near the end of the TPE test. Flow was established through the more permeable gravel interval.

#### 3.4.2 Technology Evaluation

The TPE test on well EW-2 at the BG-04 site demonstrated that TPE is effective in simultaneously removing volatile contaminants from both the vadose zone and groundwater in moderate-permeability formations. Although this site did not appear to have significant vadose zone contamination, the high vapor flow rate and high formation vacuums indicate that vadose zone removal would have occurred. The results support the existing remedy profile for

TPE because the site conditions fall within the bounds of the current TPE profile.

This site demonstrated a classical response to TPE. Groundwater flow rate declined early in the test and stabilized at 2-3 gpm as the formation dewatered. Vapor flow increased through the test and stabilized at 25-30 scfm as the subsurface dewatered and desiccated. Complete drawdown of the saturated zone into the Pierre Shale (23 feet) was obtained in EW-2.

Approximately 20,000 gallons of TCEcontaminated groundwater were removed during the seven-day test. This water was stripped by the process to below maximum contaminant levels (MCLs) without additional treatment. Approximately 98 percent of the TCE removed was in the vapor phase, indicating excellent stripping efficiency from the groundwater. Additional TCE was volatilized from the sediments as the formation dewatered. Both hydraulic and vacuum radii of influence were greater than 50 feet. Calculations indicate that TPE would likely result in a contaminant removal rate at least 2-3 times greater than could be obtained with traditional pump and treat at this site.

### 4.0 BASE-SPECIFIC RECOMMENDATIONS

Ellsworth AFB is planning a time-critical removal action to address the off-base plume at BG-04. The results of this test indicate that the TPE process could be effective in remediating this plume and controlling the further migration of the main plume off base.

Recent data collected by RUST indicate that the highest TCE concentrations in the off-base plume area are on the base fence line near EW-2 (22-44 micrograms per liter [ug/L]) and along the E-W road approximately 3,000 feet southeast of EW-2 (25-34 ug/L). Low concentrations have been detected further southeast (downgradient). It is possible that contamination has migrated rapidly along paleochannels eroded into the surface of the Pierre Shale.

A TPE system is probably the most aggressive technology available to contain and remediate this plume. It would likely result in an accelerated TCE cleanup rate over conventional technologies and remediate the site in the shortest possible time. To reach these goals, it is recommended that a TPE system be installed along the base boundary to prevent further off-base migration of the plume, effectively cutting off a continuing source. A second system installed along the E-W road would effectively isolate the highest concentration portion of the plume and prevent it from spreading while helping to remediate this portion of the plume in an accelerated time frame.

The stripping efficiency of the TPE process demonstrated at this site should allow the direct surface discharge of the extracted groundwater at concentrations below the MCL without the need for construction of a treatment plant or hauling of the water. This water could be discharged to stock ponds, such as the one located near the fence line, for beneficial reuse by local ranchers and farmers.

### 5.0 REFERENCES

Radian Corporation, 1996. Ellsworth AFB Operable Unit 11 Two-Phase Vacuum Extraction Pilot-Scale Test Work Plan, Ellsworth AFB, South Dakota, April.

U.S. Air Force, 1995. United States Air Force Presumptive Remedy Engineering Evaluation/Cost Analysis (PREECA), Final, 5 May.

EA Engineering, Science, and Technology 1995. Remedial Investigation Report, OU-11 Ellsworth AFB, SD, September.

Rust Environment and Infrastructure 1995. Technical Memorandum, Summary and Recommendations for Further Characterization of TCE Contamination at BG-04, Ellsworth AFB, SD, 6 November.

Rust Environmental and Infrastructure 1996. Seismic Refraction Survey, BG-04/TCE Investigation, Ellsworth AFB, SD, January.

# APPENDIX A

Well Drilling and Development Logs

SINGLE COMPLETION WELL	
CONSTRUCTION LOG	Well Number <u>EW-Z</u>
Project Ellsworth 2-Phase Test	Project Number 612-001-31-30
Location BG-U4 Plune (W-11	Datum (Mound Scuface
Top of Casing Elevation	Ground Surface Elevation
<b>→</b> M →	•
	BORING
	A. Total Depth (ft) 33
G	B. Boring Diameter (in.) 1034  Drilling Method Hollow Stem Augur
	Drilling Method Hullan - Stem Augur
	WELL CONSTRUCTION
	C. Casing Length (ft) 33
	Type Sch 40 PVC
	D. Casing Diameter (ft) <u>0.33</u>
E H	E. Depth to Top of Slotted Interval (ft) 13
	F. Perforated Casing Length (ft) 10
	Perforated Interval From 13 to 23 ft
	Perforation Type Continuous Slot
	Perforation Size O.02.4
A C I	G. Surface Grout Interval (ft) O-lo
	Grout Material Purtland Centent
	H. Backfilled Interval (ft)
	Backfill Material NA
	I. Sealed Interval (ft) 6-12
	Seal Material Bentonite Pellets
	J. Filter Pack Interval (ft) 12-25
	Pack Material 10/20 Silica Sand
	K. Bottom Seal Interval (ft) 24-25
	Seal Material Brutowik Pellets
	L. Depth to Top of Casing (in)
	M. Protective Casing Diameter (in)
	Blank cosing from 23 to 33 ft.
	<del>-</del>
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15. SOPTH OR NOLES WITO ROCK  16. SOPTH OF WALE  17. SHER WATER LIVEL MAUSURADITS (SPECITY)  18. SOTTEMBER  19. STATE MAUSER OF CORE BOILE MA  18. SOTTEMBER  19. STATE MAUSER OF CORE BOILE MA  18. SOUTHWALL MAUSES  19. SOUTH MAUSER OF CORE BOILE MA  18. SOUTHWALL MAUSES  19. SOUTHWALL MAUSES  10. SOUTHWALL	12. OYERBURO	DEN THICKNE	<sup>SS</sup> 70	££		· · · · · · · · · · · · · · · · · · ·	1	5. DEPTH							7
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NA	14. TOTAL DE	PTH OF HOL	£				1	7. OTHER	WATER LEVEL	WEASUR	ements (specie)	7			7
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CELTRIC DEPTH DESCRIPTION OF MITERIALS PREDICTS CONTROL SLAWL SECURITY RECOVERY RECO					BACKFILLED	MONITORING Y	NUT	OTHER	(SPECIFY)	Z3. SIG		ECTOR			
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		DRILLING	LOG				HOLE NO. 5W-Z	1348
PROJECT	Ellsw	orth 2-Phase Inspe	ctor Gary	Dyla			SHEET 2 SHEETS 2	
GRAPHIC LOG g	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO.	SAMPLE INTERVAL I	RECOVERY 9	REMARKS h	10
	11 = 12 = 13 = 13 = 1	Sandy Clay Yellow Brown  10 4R 616, moist, mixed with  fine soud and occassional  peobles.  CL	HS=\$ 10-12'		lo-15°	5'	Soil Screnzo	13
-0 0- 06	14-	Clayey Geowel Brown, to Yellow Brown. Verry poorly sorted, loose to sticky with day,	HS=4 14-15'				BZ=4	14
0 -	16—	Brown. Verry poorly sorted, loose to sticky with day, highly variable compositions, colobles to 6" diamaker. Saturated at 17ft.			15-20	3'5"		16 17 18
0-00	19-	Weathered Pierre Stale				·		19
	7	Light Olive Brown 25 45/6, wet and becomes moist with depth, variated coloring. Stroken to plastic.			20-25	51	B≥=φ	23 12 24 12 25
	26— 27—	TUTUZ DEPTH = 33ft WA	samped		25-30			- 74 - 71 - 79
	29. 30	PROJECT Ellsworth 2-	Phose			HOLE NO.	EW-Z	

SINGLE COMPLETION V	WELL, D.1
CONSTRUCTION LOG	Well Number P-
Project Ellswarth 2-Phase	Project Number 612-(101-31-30
Location BG-04 Plume	Datum Ground Surface
Top of Casing Elevation	
<b>→</b> M →	
	BORING  A. Total Depth (ft) 23
	G B. Boring Diameter (in.)
	Drilling Method Hullow Stem Augur
	WELL CONSTRUCTION
	C. Casing Length (ft) 23
	Type Schedule 40 PVC
	D. Casing Diameter (ft) 6.167
	E H E. Depth to Top of Slotted Interval (ft) 13
-a-	F. Perforated Casing Length (ft)
	Perforated Interval From 13 to 23 ft
	Perforation Type (autinuous Slot
	Perforation Size O.Ol"
A C	G. Surface Grout Interval (ft) 0-9
	Grout Material Portland Cement
	H. Backfilled Interval (ft)
	Backfill Material NA
	I. Sealed Interval (ft) 9-11
	Seal Material Bentowite Chips
	J. Filter Pack Interval (ft) 11-23
	Pack Material 10/20 Silica Sond
F .	K. Bottom Seal Interval (ft) NA
	Seal Material
	L. Depth to Top of Casing (in)
	M. Protective Casing Diameter (in)
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A-4

CIVICIA CONTRA	
SINGLE COMPLETION WELL	Well Number P-Z
CONSTRUCTION LOG	
Project Ellsworth 2-Phase	Project Number 612-001-31-30
Location BG-UT Plume	Datum Ground Surface
Top of Casing Elevation	Ground Surface Elevation
M —	BORING
A L	A. Total Depth (ft) 23
	B. Boring Diameter (in.)
	Drilling Method Hollow Stem Augur
	WELL CONSTRUCTION
	C. Casing Length (ft) 23
	Type Schedule 40 PVC
	D. Casing Diameter (ft) 0.167
E H	E. Depth to Top of Slotted Interval (ft) 12
-D-	F. Perforated Casing Length (ft) 10
	Perforated Interval From 12 to 22 f
	Perforation Type (Chilinucks Slot
	Perforation Size O.Ol"
A	G. Surface Grout Interval (ft) 0-8
	Grout Material Portland Cement
	H. Backfilled Interval (ft) NA
	Backfill Material NA
	I. Sealed Interval (ft) 8-10
	Seal Material Bentuite Chips
	J. Filter Pack Interval (ft) 10-72
	Pack Material 10/20 Silica Sand
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	Seal Material WA
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S. NAME OF DRILLER						6. MANUF	icturer's des	GNATION	OF DRILL	ME-55			
7. SIZES AND TYPES	OF DRILLING		nch hollow	Stem		8. HOLE L	OCATION B	( <i>t</i> ~C)	4 Plum				7
		and	ers, couting		-	9. SURFAC	E ELEVATION	·				•	
		bac	19-			10. DATE	STARTED S	-15-	96	11. DATE COMPL	ETED 5	15-96	
2. OVERBURDEN TH	HICKNEZZ (8)	<del>tt</del>				IS. DEPTI	GROUNDWATE			z. ft			7
3. DEPTH DRILLED		-				16. DEPTI	TO WATER AN	O ELAPS	ED THE AFTER		TED		
4. TOTAL DEPTH O	FHOLE 2	3 f1				17. OTHE	R WATER LEVEL	VEASUR	EMENTS (SPECIF)	n			_
18. GEOTECHNICAL			DISTURBED	Юни	STURBED		19. TOTAL HUN	BER OF	CORE BOXES				
20. SAMPLES FOR C	CHEMICAL ANALYS	is.	voc	METALS		OTHER	(SPECIFY)	ОТН	ER (SPECIFY)	OTHER (SPE	CITY)	21. TOTAL CORE RECOVERY	7
-1.2 12 12 12 12 12												z z	
22. DEPOSITION OF Piczane		:	BYCKULTD	MONITORING Y	METT	OTHER	(SPECIFY)	23. SIG	HATURE OF INSP . I	ECTOR			
GRAPHIC GRAPHIC	.40				FIELD	SCREENING	GEOTECH :	SAMPLE	SWARD				
LOG DEP		0E	SCRIPTION OF MATERIALS			Q EZNT12	OR CORE S		INTERVAL	RECOVERY		REMARKS h	
///	= 514	clay	Brown, plast	ic, moist							P	z=\$	F
/// 1-	= Loops	and e	bass in to 6."		H5:	•			1		~	γυγ	E
///	= CL				2	<b>ፋ</b> ′							E
/// 2-	=							•	0-5'	5'	ļ		F
//	∄		·										E
3.	San	& Bro	dun to five o	3, well									E
			enanta rine (	jianiex,									E
	HZ E		, 0										E
5									ļ		-		E
	San	Jy Sit	+ Brown, 104	r 413,									F
6	- wite	luk	nedium to tin	<i>e</i> sand <sub>j</sub>									F
· —	-	ole, o	key.		'								E
7	日 MH								5-10	4'1"			E
					.]					' '			E
// /  "	1 5m	<u>طهم دا</u>	icy Brown, 19 mynty plastic	U 4R513	HS:	- d							E
و  / / /	- mois	+, 51	lightly plastic		10							3Z=0	E
	F CE				5-	۲.					``	- Ε-φ	F
///10		PR	OJECT		<u> </u>	<del></del>			1	HOLE NO.	<u> </u>	# · · · · · · · · · · · · · · · · · · ·	
,			Ellswor	th 2-1	Pha	Se				1	P-Z		

		DRILLING	LOG				HOLE HO. P-Z	1324
PROJECT	Ellsu	udith 2-Phase like	ECTOR Gary	Dyla			SHEET Z SHEETS Z	
GRAPHIC LOG q	ОЄРТН В	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO.	SAMPLE INTERVAL I	RECOVERY g	REMARKS h	10
	10 =	Sundy Clay - a s above		·			·BZ-6	
000	12-	Clayer Grave - Yellow Bruwn, wary Foody sorted, clay to colors, subround peobles, variable color, loose.  Saturated at 1512 ft.	HS=0		10-15'	3'	Soil=¢	
000	14-	Saturated at 15/2 ft.	10-13					<u> </u>
0	16-							
8 DO	18-	Growel - Poorly sorted, No Clay in matrix. Saturated GW Weathered Pierre Shale	HS=d 17-10		17-70	Z'	- B2=φ	سلساسا
	19	Plastic, light olive group, damp to moist.				·		
	21-				70-73	3'		
	22-	Tertal Depth = 23 ft.						
	24—							
	26-		-					mhm.
	27	PROJECT Ellsworth 2-P	-			HOLE HO.	ا ا	E

DRII	LLING	LOG					HOLE	10. P-3
			R Mai	īm 7	Contrada	cies		1
2-Dhove to L/	BC ~M	4. LOCATION		(111,	NON	71-7	10+	1 ZHEFIZ C-
+	Deat	6. NAMUFAC	TURER'S DES	GNATION	OF DRILL (W	1F-56		,
	fem ance	8. HOLE LOX	CATION R				-11	
				0 0				<del></del>
		10. DATE 5	<sup>(ARTED</sup> 5-	15-9	la .	11. DATE COMPL	ETEO 5	-15-96
ft		15. DEPTH			TERED (8)	ft	<u>~</u>	(3 10
		16. DEPTH	O WATER AN	O ELAPSE	D TIME AFTER	DRILLING COMPLE	TED	
<del>\$\)</del>		17. OTHER	WATER LEVEL	WEASURE	EMENTS (SPECIF	r)		•
DISTURBED	UHDIST	TURBED 19.	TOTAL HUM	BER OF C	ORE BOXES	<b>ν</b> Α		
voc	METALS	OTHER (	SPECIFY)	OTHE	R (SPECIFY)	OTHER (SPE	CETY)	21. TOTAL CORE RECOVERY
BACKELLED	MONITORING WE	IL OTHER (	S2EC2FY)	23. 5103	ATTRE OF MISE	FCTOR		, x
				ğ	1 1	) /a _		
DESCRIPTION OF MATERIALS		FIELD SCREENING RESULTS			SAMPLE INTERVAL	RECOVERY		REMARKS h
Snown were 43	, frichle,	1-31		-	O-5	4'1"		B2>
fine to medium so	and,	5-8'			5-10	3'B"		Bz= <b>¢</b>
	2-Prose Test /  t  2-Nich Lollows  Continuous Core  Charles  Charl	2. ORREL 2-Phase test/RG-CA  t 2-Mach hollow stem anger continuous care barrel  ft  OISTURBED UNDOS  VOC METALS  BACKFELED MONITORING ME  OESCRIPTION OF MATERIALS  GRADY CLay Dowle Brown, Shows, 75 YR 2.5/2.  -, Maist.  Brown W YR 4/3, frictile, inc sand, becomes dayed and than.  Clay Brown 10 YR 5/3, Private medium sand, Norst, shottly plastic,	2-Prase test / RG-OA  6. MANNIFAC  2-INCh hollow stem apages  8. HOLE LOC  CONTINUOUS CORE DOCTES  10. DATE ST  11. DEPTH  11. OTHER  12. DEPTH  13. DEPTH  14. DISTURBED UNDISTURBED 19.  POC METALS OTHER (S  BACKFILLD MONITORING WELL OTHER (S)  CESCRIPTION OF MATERIALS  CESCRIPTION OF MATERIALS  CONTINUOUS RESULTS  CONTINUOUS RESULTS  CONTINUOUS AV3, frichle, in-e sand, becomes dayed  Stown to ye 4/3, frichle, in-e sand, becomes dayed  Stown to ye 4/3, frichle, in-e sand, becomes dayed  Clay Brown 10 ye 5/3,  Chay Brown 10 ye 5/4,  Chay Brown 10	2. DRELING SUBCONTRACTOR MAL  2-Phase test / RG-CA  4. LOCATION  4. LOCATION  4. LOCATION  5. MANUFACTURERS DES  2-INCh hollow stem allocato  10. DATE STARTED  10. DATE STARTED  11. DEPTH TO WATER AN  11. DEPTH TO WATER AN  12. DEPTH TO WATER AN  13. DEPTH TO WATER AN  14. DISTURBED  14. DISTURBED  15. DEPTH GROUNDWATE  16. DEPTH TO WATER AN  17. OTHER WATER LEVEL  18. DEPTH TO WATER AN  19. OTHER (SPECIT)  DESCRIPTION OF MATERIALS  18. DEPTH TO WATER AN  19. OTHER (SPECIT)  DESCRIPTION OF MATERIALS  18. DEPTH TO WATER AN  19. OTHER (SPECIT)  DESCRIPTION OF MATERIALS  18. DEPTH TO WATER AN  19. OTHER (SPECIT)  19. TOTAL MAN  19. DETHE WATER AND  19. TOTAL MAN  19. DETHE WATER AND  19. TOTAL MAN  19. DEPTH TO WATER AN  19. DEPH TO WATER AN  19. DEPHH TO WATER AN  19. DEPH	2. DRALING SUBCONTRACTOR MAYIM  2. PROJECTEST / BG-CA  4. LOCATION  2. PROJECT TEST / BG-CA  4. LOCATION  3. MALE LOCATION  3. SUBFACE ELEVATION  10. DATE STATED 5-15-9  11. DEPTH GROUNDWATER ENCOUN  11. DEPTH TO WATER AND ELAPSIE  17. OTHER WATER LEVEL MEASURE  VOC METALS OTHER (SPECTY) OTHER  18. DEPTH TO WATER LEVEL MUNICIPALS  VOC METALS OTHER (SPECTY) 23. SIGN  DESCRIPTION OF MATERIALS  RESULTS  OR CORE BOX NO.  18. DEPTH TO WATER LEVEL MUNICIPAL  OR CORE BOX NO.  18. DEPTH TO WATER LEVEL MUNICIPAL  POSTURBED  UNDISTURBED  UNDISTURBED  UNDISTURBED  OTHER (SPECTY)  23. SIGN  RESULTS  OR CORE BOX NO.  14. 3 (  1-3	2-Prase test / RG-OA  1. LOCATION  2-Prase test / RG-OA  4. LOCATION  4. LOCATION  4. LOCATION  4. LOCATION  5. MARKETERETS DESIGNATION OF DRELL (NO  10. DATE STARTED  11. DEFIN GROUNDWATER ENCOUNTERED (NO  11. DEFIN GROUNDWATER ENCOUNTERED (NO  12. DEFIN GROUNDWATER ENCOUNTERED (NO  13. DEFIN GROUNDWATER ENCOUNTERED (NO  14. DESTURBED (NONSTURBED (NO THER (SPECIFY)) OTHER (SPECIFY)  15. DEFIN GROUNDWATER ENCOUNTERED (SPECIFY)  16. DEFIN (NO WATER LAW) CLASSED THE AFTER  17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)  18. DETINBED (NONSTURBED (NO THER (SPECIFY)) OTHER (SPECIFY)  21. SICHATURE OF RESPUES  19. DOTAL MANBER OF CORE BOXED  10. DATE STARTED  10. DATE STARTED  11. DOTAL MANBER OF CORE BOXED  12. SICHATURE OF RESPUES  13. TOTAL MANBER OF CORE BOXED  14. DOTAL MANBER OF CORE BOXED  15. DEFIN GROUNDWATER LEVEL MEASUREMENTS (SPECIFY)  21. SICHATURE OF RESPUES  15. DOTAL MANBER OF CORE BOXED  16. DEFIN (SPECIFY)  21. SICHATURE OF RESPUES  16. DEFIN (SPECIFY)  22. SICHATURE OF RESPUES  24. DEFIN (SPECIFY)  25. DEFIN (SPECIFY)  26. DEFIN (SPECIFY)  27. DEFIN (SPECIFY)  28. DEFIN (SPECIFY)  29. DEFIN (SPECIFY)  21. SICHATURE OF RESPUES  29. DEFIN (SPECIFY)  21. SICHATURE OF RESPUES  22. SICHATURE OF RESPUES  23. SICHATURE OF RESPUES  24. DEFIN (SPE	2-Proje Test RG-CA  L LOCATION  A LUCATION  A LUCATION  A LUCATION  A LUCATOR MATTER DESCRIPTION OF DRELL (ME-55- 2-INCh bollow stem analyses a substance elevation of Drell (ME-55- 2-INCh bollow stem analyses a substance elevation of Drell (ME-55- 2-INCh bollow stem analyses a substance elevation of Drell (ME-55- 2-INCh bollow stem analyses a substance elevation of Drell (ME-55- 2-INCh bollow stem analyses a substance elevation of Drell (ME-55- 2-INCh bollow stem analyses and elevation of Drell (ME-55-  10. DATE STARTED 5-15-96	2-Projeted Road Library Sessionation of DRIL (ME-55)  2-Projeted Road Library Sessionation of DRIL (ME-55)  2-Inch hallow stem allocates a Mark Editation BG-CLA Plume-OM-II  20-Inch hallow stem allocates a Mark Editation BG-CLA Plume-OM-II  21-DEPTH GROUNDARIES ENCOUNTERED 11-DATE COMPLETED  21-DEPTH GROUNDARIES ENCOUNTERED 19-DATE OF BEST THE ATEX DRILLING COMPLETED  21-DEPTH GROUNDARIES ENCOUNTERED 19-DATE (SPECTY)  21-DEPTH GROUNDARIES THE ATEX DRILLING COMPLETED  21-DEPTH GROUNDARIES TO CORE BOILS NA  21-DEPTH GROUNDARIES OF CORE BOILS NA  21-DEPTH GROUNDARIES OF CORE BOILS NA  21-DEPTH GROUNDARIES THE ATEX DRILLING COMPLETED  21-DEPTH GROUNDARIES AND THE ATEX DRILLING COMPLETED  21-DEPTH GROUNDARIES THE ATEX DRILLING COMPLETED  21-DEPTH GROUNDARIES AND TH

		DRILLING	LOG				HOLE HO. P-3	13248
PROJECT (	Ellsw	orth Z-Phase Inspe	ctor Gary	Dyke			OF Z SHEETSZ	1
GRAPHIC LOG q	DEPTH b	DESCRIPTION OF MATERIALS	LIETD SCREENING SEZOTZ	GEOTECH SAMPLE OR CORE BOX NO.	SAMPLE INTERVAL 1	RECOVERY 9	REMARKS h	10
	11		RESULTS	OR CORE BOX NO.	INTERVAL			
	28	PROJECT Ellsworth 2-P.V	lase			HOLE NO.	P-3	<u>E</u>

CINCI	TE CON	MIT TOTALONI	XXXXX X	
		IPLETION I OC	WELL	Well Number P-3
		ION LOG		
1 .	_	2-Phase		Project Number 612-001-31-30
}	36-04 Plui			Datum Grown Surface
Top of Casi	ing Elevation			Ground Surface Elevation
	_	<b>→</b> M <b>→</b>		BORING
Å L			<b>A A</b>	A. Total Depth (ft) 23
1	¥		G	B. Boring Diameter (in.)
				Drilling Method Hallow Stom Awger
			<del> </del>	WELL CONSTRUCTION
				C. Casing Length (ft) 23
				Type Schodule 40 PVC
				D. Casing Diameter (ft) 0-167
			E H	E. Depth to Top of Slotted Interval (ft) 13
		-a-		F. Perforated Casing Length (ft)
				Perforated Interval From 13 to 23
				Perforation Type Cautinuous Slot
			<b>V</b> 0.	Perforation Size 0.01"
A			Å:	G. Surface Grout Interval (ft) 0-9
			<b>*</b>	Grout Material Portland Coment
	•		<b>A</b> -	H. Backfilled Interval (ft)
				Backfill Material NA
	<b>T</b>		<u> </u>	I. Sealed Interval (ft) 9-11
	Ī			Seal Material Bentouite Chips
				J. Filter Pack Interval (ft) U-73
			I	Pack Material Silica Sand
	. <b>F</b>		Ĭ	K. Bottom Seal Interval (ft)
				Seal Material NA
				L. Depth to Top of Casing (in)
	1			M. Protective Casing Diameter (in)
•	<u> </u>		¥±.	
			<del> </del> K	·
<del>                                     </del>		R ——		
		- "	A 10	· · · · · · · · · · · · · · · · · · ·
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MASTER

On May 9, 1995 Huntingdon became MAXIM

Huntingdon Engineering & Environmental, Inc.

640 West Main Street Lead, South Dakota 57754 (605)584-2007 Fax:(605)584-2007 2821 Plant Street P.O. Box 6703, 57709-6703 Rapid City, South Dakota 57702-0335

Chemistry (605)341-7284 Engineering/Environmental (605)348-5850

•						Fax: (605)341-086	
		A_4			r Poststata	TellOdl	
ell Designation te Grouted		1 +	9/	Development .	lechnician	7 -7 - 0 200	<u></u>
				Date developmen	nt concluded	5-16-96	
ite Developmen ngth of Sandpac	i Started _	131	- (B	Date developmen		· · · · · · · · · · · · · · · · · · ·	
pth of Well	~~			•			
pth to Water	16-	50	Denth (	NADI :			
pui to water	4/1	0 11 -	. Depart	(vol. of water in 2" PV	<u></u>		
inid Depui	9/1	400 - :	350	(vol. of water in $10^{4}$ bo	vehole)!	•	
l of works in (	-41 borobo	10 ( 3 <	) iori (	of water in 2" PVC ( /-	4 1 = 73.	(vol. of annular	snace
i. Of water in /	o ooreno		. ۱۵۱۰ ر	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<del></del>	<del></del> ` .	•
I of annular ro	200 ( 33	L > 0 30	- (10.	(vol. of water held i	n sandnack)		
d of water in s	andnack (	/A L \ +	vol of w	vater in 2"PVC (1.4)	= ( //.5 ) (0	ne well volume)	
of water in s	mapaok (	70.1	101. 01 1	, , , , , , , , , , , , , , , , , , , ,		· ·	
	·	Υ	1		·	<del></del>	7
WELL	GAL	TIME	pН	CONDUCTIVITY	TEMP	TURBIDITY	
VOLUME		.,	,	uMHOS	C.	NTU	
•	<del>                                     </del>		1				7
INȚIAL	0	16:30	7.89	1150	15.3	21000	_
1	14.5	16:55	7.81	1050	16.8	>1000	
			2.89	1050	15.4	71600	7
<u> </u>	down	17:18	2.0.1	1050	1,0.7	· ` `	$\dashv$
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	•		22.0	٠ .			
otal number of g			12.	Average pt	umping rate	. 1	
quipment used		en ver	· · · · · ·		Number of dr	ums generated	
omments:							
Juniciie:							
ommens.							
Jimiens.							

If the height of the sandpack is greater than the liquid depth, use the height of the sandpack to determine the vol. of the borehole.

Bekels: 1

# On May 9, 1995 **Huntingdon** became **MAXIM**

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Chemistry (605)341-7284 Engineering/Environmental (605)348-5850

	15.	44'	_ Depth t	o NAPL			
id Depth id Depth		x . = -		o NAPL	/C)		•
of water in	boreh	ole (	)- vol. o	f water in PVC (	) =	(vol. of annular	space).
•	•			) (vol. of water held		•	
of water in s	andpack	+ (	vol. of w	ater in: PVC (	$\frac{111 \text{ sandpack}}{25}$	one well volume)	
	<del></del>	<del></del>					
WELL VOLUME	GAL	TIME	pH	CONDUCTIVITY uMHOS	TEMP C	TURBIDITY NTU	Sugala
INITIAL	0	13:48	\$8.02	900	17.7	> 1000	Bailer
<u> </u>	4						Starfed :
	10	描				·	Started: W/Surgel & P -1 Barle
	10	14:30		-			SLL
·	28						Purped
	28	15:09				·	ship.
		15:15	7.83	1200	16.8	2/000	
<del> </del>		15:19					
		15:22	7.38	1100	18.2	Cher	
		15:30	7.81	1050	12.8	Chan.	
		15:50		·			Slut pun Let well
		16200	7.77	1050	13.2	Clar	Shetpu
		16:10					END
	17530						
	10			92 Average pu			- 1

If the height of the sandpack is greater than the liquid depth, use the height of the sandpack to determine the vol. of the borehole.

On May 9, 1995 Huntingdon became MAXIM

Huntingdon Engineering & Environmental, Inc.

640 West Main Street
Lead, South Dakota 57754
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Chemistry (605)341-7284

Engineering/Environmental (605)348-5850 Fax: (605)341-0868

	0.				1	- L. VII	1,0
Well Designation _	7-2	- 41		Development Te	chnician	, , ,	Ke
Date Grouted	Chartad	5-15-96	1/.	Date development	concluded	5-16-96	
Date Development Length of Sandpac	Started _	5-16-1	<u>e</u>	Date de l'elepineur			
Depth of Well							
377.4	:0 1		Depth	to NAPL			
	_	1.16 = <u>1</u>	26_	(vol. of water in 2" PVC)	1 1 21.5		
Liquid Depth	<u> </u>	407 = 5	2./5	(vol. of water in 12 1 vo) (vol. of water in 16" bore of water in 2"PVC (1.26)	$\lambda = 30.8$	9 (vol of annular sp	ace)
	( <del>&gt;</del> 1\ 0	9 1, 0 20	- 196	(7) (vol. of water held in vater in 1" PVC (1.26) =	sandpack)		
WELL VOLUME	GAL	TIME	рH	CONDUCTIVITY . uMHOS	TEMP C	TURBIDITLY NTU	
INIȚIAL	0.	15:01	7.92	900	18,0	71000	
	10.5	15:37	7.86	850	17.1	> 1000	'
	21	16:07	7.82	1160	17.5	7/000	
	31,5	[6:40	7.89	1150	14.6	17100	
					- 1	,	
	,				1 X 12	The state of the s	-
				*	390	***	
					6	- 100 - 100	
			'			٠. الم	
			·		***		
			·	·			**
							.,
Total number of g Equipment used Comments:	gallons rer	noved	31.5	Average pur		ums generated	
		<u> </u>				7	

A member of the (HIH) group of companies

If the height of the sandpack is greater than the liquid depth, use the height of the sandpack to determine the vol. of the borehole.

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TC2= 1/5/2/7.48

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24= 0.16 10"= 4.07

2

3€

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only = 0.3	1/0 >
Well Designation [7-3]	Development Technician 48 2444
Date Grouted	C-11 -91.
Date Development Started 5-16-94	Date development concluded 5-16-96
Length of Sandpack	
Depth of Well 25.1	
Depth to Water 15.75	Depth to NAPL
Liquid Depth $9.35 \times 0.16 =$	
Liquid Depth $9.35 \times 4.07 = $	38 '- (vol. of water in 10" borehole)
Vol. of water in /6 borehole ( 38	)- vol. of water in 2" PVC ( $1.5$ ) = $36.5$ (vol. of annular space)
Vol. of annular space ( 36.5 )x 0.30	= ( // ) (vol. of water held in sandpack)
Vol. of water in sandpack ( // ) +	vol. of water in $?"$ PVC $(/.5) = (/2.5)$ (one well volume)

WELL VOLUME	GAL	TIME	pН	CONDUCTIVITY uMHOS	TEMP C	TURBIDITY NTU
INITIAL	0	14:25	2.76	950	23.5	·
,	12.5	1500	7.81	875	17.5	
,	25.0	1535	7.90	1100	19.2	
	31.5	1625	7.86	(000	16.0	
						~
					-	
				•		
						٠
						,

Total number of gallons removed	Average pumping rate
Equipment used	Number of drums generated
Comments:	
	·

<sup>&</sup>lt;sup>1</sup> If the height of the sandpack is greater than the liquid depth, use the height of the sandpack to determine the vol. of the borehole.

					•	Page	of
	. 11				ERIALS LOG		
Project	Ellsworth. 2						
City	Ellant AFB	State	Sout	h Dal	Lota		
		60000000000000000000000000000000000000					
Drum Number	Well or Bonng Number	Material Type:		Filed	Location Moved to	Pinal Disposition	Signatures of Movers
	EW-2.	Soil	5/14	E/MAU			
2	EW-Z	5011	5/14	5/A/A6			
3	EW-Z	Soil	5/14	5/4/96			
4	EW.Z	peron wenter	5/1<	=/rA4	,		
5	EW-2, P-2	Decon, Water		5/15/46			
6	EW-Z	Decon. Water	5/14	5/K/94		·	
7	Ew.2	So:l	5/15	5/KAY			
ષ્ટ	P-3	Soil	-/15	5/K/90			
9	P-Z	30:1	415	SIRFIE			
(0)	P-1	So:1	5/15	5/15/91	/	•	
·							
						-	
1							

APPENDIX B
Field Data Tables

Time	H	5	otor I and		4		1		_			
Time         P1         P2         P3         941148         93BCb4         P1         P2         P3         (nb)           16.35         18.02         18.02         18.77         17.22         13.79         28.33         0.0         0.00         65         888           16.20         18.46         18.77         17.22         13.79         28.33         0.0         0.00         65         888           17.20         18.66         19.15         17.26         -         -         1.5         0.50         0.31         60         898           21.35         18.86         19.45         17.26         -         -         1.5         0.50         0.31         60         898           21.35         18.86         19.45         17.23         -         -         1.2         0.50         0.31         60         898           21.35         18.86         19.45         17.24         1.3         2.7         1.00         0.70         892         900           21.35         18.96         17.57         1.3         1.3         1.3         1.3         1.3         1.3         1.3         1.0         9.2         9.0         9.0<	-	\$ **	ferometers		op of casin Monitori	gy ng Wells W)	Přezo	meter Vaci	· mm	~ ~ ~		
18:25   18:02   18:77   17:22   13:79   28:33   0.00   0.00   65   898     16:502   18:46   18:97   17:23			P2			93BG04	PI	P2	<b>b</b> 3	(deg F)	(qm)	Comments
16.07   16.0		18.02		17.22	13.79	28.33	0.0	0.00	0.00	65	868	898 Pre test readings
16:20         18.46         18.97         1723         -         1.5         0.50         0.31           17:20         18.66         19.15         1726         -         1.3         0.64         0.40           17:20         18.66         19.15         17.26         -         1.3         0.64         0.40           17:20         18.86         19.15         17.26         1.3         0.54         0.58         0.60           21:35         18.80         19.45         17.32         13.8         2.4         0.94         0.58         0.90           21:35         18.86         19.65         17.52         13.8         2.7         1.00         0.70         55         900           9:00         19.16         19.65         17.54         13.8         2.7         1.00         0.70         55         903           10:00         19.16         19.66         17.56         13.8         1.30         0.72         50         903           10:00         19.17         19.77         17.69         13.4         13.0         0.73         0.73         0.73         0.73         0.73         0.73         0.73         0.73         0.73												begin test 1-1/4" straw
1700         18.66         19.15         17.26         1.8         0.64         0.40         8.8           1702         18.06         19.15         17.26         1.28         2.1         0.69         0.45         6.0         88           1702         18.31         19.81         17.32         1.38         2.6         0.92         0.60         55         900           21:35         18.96         19.45         17.54         2.6         0.92         0.60         55         900           7.25         19.12         19.61         17.54         3.3         1.00         0.70         55         900           11445         19.16         17.54         3.3         1.00         0.70         55         900           11440         19.16         17.54         3.3         1.00         0.70         55         900           11440         19.16         17.54         3.3         1.00         0.70         55         900           11440         19.16         17.54         3.3         1.30         0.72         900           11000         19.18         19.68         17.6         17.24         3.3         1.10         0.70<		18.46		17.23	•	,	1.5	0.50	0.31			
17.25         18.71         19.19         17.26         0.54         0.69         0.45         6.0         898           18.00         18.81         19.28         17.28         17.28         1.24         0.94         0.58         6         898           2.13         18.06         19.61         17.22         13.8         2.7         1.00         0.70         55         900           2.20         19.12         19.61         17.53         13.8         2.7         1.00         0.70         55         900           11.45         19.16         19.62         17.53         13.8         2.7         1.00         0.70         55         900           11.45         19.16         19.63         17.54         13.8         2.7         1.00         0.70         55         903           11.45         19.16         19.69         17.66         13.81         3.1         1.10         0.70         55         903           10.00         19.17         17.7         13.78         3.3         1.20         0.79         60         903           11.30         19.18         19.71         17.7         13.78         28.3         1.20		18.66		17.26			1.8	0.64	0.40			end 1-1/4" straw test
18.00         18.81         19.28         17.28         2.4         0.94         0.58         90           21.35         18.26         19.45         17.37         3.2         0.02         0.00         55         900           7.00         19.16         19.63         17.52         13.8         2.7         1.00         0.70         55         900           9.00         19.16         19.65         17.54         13.8         2.7         1.00         0.70         55         900           11.44         19.16         19.66         17.58         13.81         3.4         1.30         0.79         900           10.00         19.16         19.66         17.68         13.81         3.4         1.30         0.79         900           10.00         19.17         19.7         17.7         3.3         1.30         0.79         90           10.00         19.18         19.27         17.7         3.3         1.30         0.79         90           10.20         19.18         19.27         17.7         13.78         28.34         3.7         1.20         0.79         90           10.20         19.28         19.21		18.71	19.19	17.26			2.1	69.0	0.45	09	868	898 1-1/2" straw began @ 17:12
2133         18.96         19.45         17.37         3         26         0.92         0.60         55         900           725         19.12         19.61         17.52         13.8         2.7         1.00         0.70         55         900           9.05         19.16         19.61         17.54         13.8         2.7         1.00         0.70         55         900           11.45         19.15         19.65         17.54         13.8         1.30         0.79         60         900           16.00         19.18         19.66         17.68         13.81         3.4         1.30         0.79         60           10.00         19.17         19.7         17.7         3.3         1.10         0.73         70           10.30         19.19         19.7         17.7         3.3         1.10         0.73         70           10.30         19.18         19.71         17.7         3.3         1.10         0.73         70           10.30         19.18         19.71         17.72         3.3         1.10         0.73         70           10.20         19.20         19.20         19.20         19.20<		18.81	19.28	17.28			2.4	0.94	0.58			raining
7.25         19,12         19,61         17,52         13.8         2.7         1.00         0.70         55           19,00         19,16         19,63         17,54         2.7         1.00         0.70         55           11,44         19,16         19,68         17,52         13.8         3.3         1.30         0.72         903           16,00         19,18         19,68         17,6         13.81         3.4         1.30         0.72         903           16,00         19,18         19,68         17,6         13.81         3.4         1.30         0.72         903           16,00         19,18         19,71         17,7         3.4         1.30         0.73         903           10,00         19,18         19,71         17,7         3.3         1.10         0.73         903           10,20         19,18         19,71         17,7         3.3         1.20         0.80         90           10,20         19,18         19,71         17,7         13.78         28,34         3.7         1.20         0.80         90           10,20         19,28         19,21         17,7         13.78         28,34		18.96	19.45	17.37			2.6	0.92	09.0	55	900	900 light rain
9:00         19:16         19:63         17:54         2.7         1.00         0.70         55           11:45         19:15         19:65         17:57         138         3:3         1:30         0.72         0.79         0.79         0.79         0.72         0.70         0.72         0.70		19.12	19.61	17.52	13.8		2.7	1.00	0.70		902	
11.45         19.15         19.65         17.57         3.3         1.30         0.79           14.40         19.16         19.66         17.58         13.8         3.6         1.30         0.79         907           16.00         19.18         19.68         17.68         17.81         13.81         3.4         1.30         0.79         907           16.00         19.19         19.71         17.68         13.81         3.4         1.20         0.79         60           10.30         19.19         19.71         17.72         3.3         1.10         0.73         70           11.50         19.18         19.71         17.72         3.3         1.10         0.73         70           11.50         19.21         17.72         13.78         28.34         3.7         1.20         0.80         55           11.50         19.22         19.71         17.72         3.3         1.10         0.73         70           11.50         19.24         17.65         17.65         4.5         1.20         0.80         55           19.25         19.24         17.65         4.5         1.60         1.05         1.05		19.16	19.63	17.54			2.7	1.00	0.70	55		
14:40         19,16         19,66         17,58         13.8         3.6         1.30         0.72         903           16:00         19,18         19,68         17,6         13.81         3.1         1.10         0.79         60           16:00         19,18         19,68         17,6         13.81         3.4         1.20         0.79         60           10:00         19,19         19,7         17,7         17,7         3.3         1.30         0.78         65           13:00         19,18         19,71         17,7         13,78         28.34         3.7         1.20         0.78         65           13:20         19,21         17,7         13,78         28.34         3.7         1.20         0.78         65           15:50         19,21         17,7         13,78         28.34         3.7         1.20         0.80         65           16:50         19,18         19,71         17,75         13,78         28.34         3.7         1.20         0.80         65           8:15         18,28         19,42         17,65         17,65         17,65         4.1         1.30         0.86         55		19.15	19.65	17.57			3.3	1.30	0.79			very windy
16:00         19:18         17.6         3.1         1.10         0.70         55         902           8:00         19:16         19:69         17.68         13.81         3.4         1.30         0.79         50.7         907		19.16		17.58	13.8		3.6	1.30	0.72			
8:00         19:16         19:69         17:68         13:81         3.4         1.30         0.79         907           10:00         19:17         17:69         13:81         3.4         1.20         0.79         60           10:00         19:17         17:7         17:7         3.3         1.30         0.78         65           13:00         19:18         19:71         17.7         13:78         28:34         3.7         1.20         0.78         65           15:50         19:2         19:71         17.7         13:78         28:34         3.7         1.20         0.80         5           21:30         19:18         19:21         17:63         28:34         3.7         1.20         0.80         5           8:15         18:28         19:42         17:63         4.1         1.30         0.86         55           8:40         18:28         19:42         17:64         4.5         1.60         1.05         1.0           10:20         19:24         17:45         4.5         1.60         1.05         1.0           10:20         19:28         17:34         13:76         4.95         1.75         1.10     <	1	19.18	19.68	17.6			3.1	1.10	0.70	55	903	903 slight wind
10:00         19:17         17:69         34         1.20         0.79         60           10:03         19:19         19:7         17.7         17.7         3.3         1.30         0.78         65           15:30         19:18         19:71         17.7         13.78         28:34         3.7         1.10         0.73         70           21:30         19:18         19:71         17.72         13.78         28:34         3.7         1.30         0.80         55           8:15         18:25         19:71         17.63         4.1         1.30         0.86         55           8:40         18:88         19:42         17.63         4.1         1.30         0.86         55           10:20         19:19         19:66         17.66         4.5         1.60         1.02         1.05           10:20         19:24         17.76         4.5         1.60         1.05         1.05         1.05           10:20         19:28         17.74         13.76         4.85         1.60         1.05         1.15           10:20         19:28         17.74         13.76         4.95         1.75         1.10		19.16	19.69	17.68	13.81		3.4	1.30	0.79		907	slight wind
10:30         19,19         19,7         17,7         3.3         1.30         0.78         65           13:00         19,18         19,71         17,7         13.78         28.34         3.3         1.10         0.73         70           21:30         19,18         19,71         17,7         13.78         28.34         3.7         1.20         0.80         70           21:30         19,18         19,71         17,72         13.78         28.34         3.5         1.30         0.80         70           8:15         18,52         19,21         17,63         4.1         1.30         0.86         55           8:40         18,98         19,42         17,66         4.5         1.60         1.02           10,20         19,24         17,66         4.8         1.66         1.05         1.05           10,20         19,24         17,76         4.8         1.65         1.05         1.05           14,00         19,25         17,74         13.76         4.8         1.65         1.05           16,30         19,28         17,81         13.76         4.8         1.65         1.05           16,10         19,28		19.17	19.7	17.69			3.4	1.20	0.79	09		slight wind
13:00         19:18         19:71         17.7         3.3         1.10         0.73         70           21:30         19:2         19:71         17.72         13.78         28:34         3.7         1.20         0.80         70           21:30         19:18         19:71         17.72         3.5         1.30         0.80         70           8:15         18:2         19:21         17.65         4.1         1.30         0.86         55           8:40         18:98         19:42         17.65         4.5         1.60         1.02           10:20         19:19         19:46         17.6         4.5         1.60         1.02           10:20         19:24         19:76         17.7         4.5         1.60         1.02           10:20         19:24         17.76         4.5         1.60         1.05         1.05           10:30         19:28         17.74         13.76         4.85         1.85         1.15           10:30         19:28         17.84         17.76         4.85         1.85         1.15           10:45         19:28         17.84         17.84         8.5         5.10         3.0		19.19		17.7			3.3	1.30	0.78	65		2" straw size
15:50         19.2         19.71         17.72         13.78         28.34         3.7         1.20         0.80           21:30         19.18         19.71         17.72         13.78         28.34         3.5         1.30         0.80         8           8:15         18.52         19.21         17.65         8         4.1         1.30         0.86         55           8:40         18.98         19.42         17.65         9         4.5         1.60         1.02           10.20         19.19         19.66         17.66         4.5         1.60         1.02         8           10.20         19.24         19.76         17.74         13.76         4.5         1.60         1.02           11.30         19.25         19.75         17.74         13.76         4.8         1.65         1.05           11.30         19.28         17.74         13.76         4.95         1.75         1.10           11.30         19.28         17.81         13.76         4.85         1.85         1.15           11.30         19.28         17.84         18.5         1.15         1.10           10.45         19.3         17.85 </td <td></td> <td>19.18</td> <td></td> <td>17.7</td> <td></td> <td></td> <td>3.3</td> <td>1.10</td> <td>0.73</td> <td>70</td> <td></td> <td></td>		19.18		17.7			3.3	1.10	0.73	70		
21:30         19.18         19.71         17.72         3.5         1.30         0.80           8:15         18.52         19.21         17.65         4.1         1.30         0.86         55           8:40         18.98         19.42         17.63         4.1         1.30         0.86         55           10:20         19.19         19.66         17.66         4.5         1.60         1.02           13:20         19.24         19.76         17.7         4.5         1.60         1.05           14:00         19.25         19.75         17.74         13.76         4.95         1.75         1.10           16:30         19.28         17.74         13.76         4.95         1.75         1.10           17:30         19.28         17.84         13.76         4.95         1.75         1.10           16:15         19.28         17.84         1.85         1.85         1.15         2.0           16:15         19.28         17.84         8.6         5.10         3.80         2.0           16:15         19.29         17.84         8.5         5.10         3.80         2.0           16:15         19.29<		19.2		17.7	13.78	28.34	3.7	1.20	0.80			
8:15       18.52       19.21       17.65       4.1       1.30       0.86       55         8:40       18.98       19.42       17.63       4.1       1.30       0.86       55         10:20       19.19       19.66       17.69       4.5       1.60       1.02         13:20       19.24       19.76       17.7       4.8       1.65       1.05         14:00       19.25       19.75       17.69       4.8       1.65       1.05         16:30       19.29       19.82       17.74       13.76       4.8       1.65       1.05         16:30       19.29       19.84       17.76       4.85       1.85       1.15       50         17:30       19.28       17.84       17.87       8.5       2.70       1.90       50         16:15       19.28       17.87       8.5       5.10       3.80       50         10:45       19.29       17.87       8.5       4.90       3.65       50         10:45       19.29       17.87       8.5       4.90       3.65       50         10:15       19.21       19.93       17.82       8.5       4.90       3.70       3.00 <td></td> <td>19.18</td> <td></td> <td>17.72</td> <td></td> <td></td> <td>3.5</td> <td>1.30</td> <td>0.80</td> <td></td> <td></td> <td></td>		19.18		17.72			3.5	1.30	0.80			
8:15         18.52         19.21         17.65         4.1         1.30         0.86         55           8:40         18.98         19.42         17.63         4.1         1.30         0.86         55           10:20         19.19         19.66         17.66         4.5         1.60         1.02           13:20         19.24         19.76         17.74         13.76         4.8         1.65         1.05           14:00         19.25         19.75         17.74         13.76         4.95         1.75         1.10           16:30         19.28         17.74         13.76         4.95         1.75         1.10           9:10         19.28         17.84         13.76         4.85         1.85         1.15           9:10         19.28         17.84         17.84         8.5         5.10         3.90         50           10:45         19.28         17.87         8.6         5.10         3.90         50           10:45         19.29         17.87         8.5         4.90         3.65         9           10:45         19.27         19.83         17.82         8.5         4.90         3.70         9												Unit off from 4 AM to 8:30 AM
8:40         18.98         19.42         17.63         4.1         1.30         0.86         55           10:20         19.19         19.66         17.66         4.5         1.60         1.02           13:20         19.24         19.76         17.7         4.5         1.60         1.05           14:00         19.25         19.75         17.69         4.8         1.65         1.05           16:30         19.29         19.82         17.74         13.76         4.8         1.65         1.05           17:30         19.28         19.84         17.76         4.8         1.65         1.15           9:10         19.28         19.84         17.84         3.6         2.70         1.9           16:15         19.28         17.87         8.5         5.10         3.80         9.0           10:45         19.29         17.87         8.5         5.10         3.80         9.0           10:45         19.21         19.93         17.87         8.5         4.90         3.65           10:15         19.21         19.83         17.82         8.6         4.60         3.70         50           10:15         19.21 <td></td> <td>18.52</td> <td>19.21</td> <td>17.65</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		18.52	19.21	17.65								
10:20         19:19         19:66         17:66         4.5         1.60         1.02           13:20         19:24         19:76         17.74         17.69         4.8         1.65         1.05           14:00         19:25         19:75         17.69         4.8         1.65         1.05           16:30         19:29         19:82         17.74         13.76         4.85         1.85         1.10           17:30         19:29         19:84         17.76         5.1         5.0         1.15           9:10         19:27         19:86         17:84         8.5         5.10         3.90         50           16:15         19:28         17:87         8.6         5.10         3.90         50           10:45         19:29         17:87         8.5         5.10         3.90         50           10:45         19:27         19:93         17:85         8.5         4.90         3.65           10:15         19:27         19:93         17:85         8.5         4.90         3.65           10:15         19:21         19:83         17:22         8.6         4.60         3.70         50           10:15 <td></td> <td>18.98</td> <td>19.42</td> <td>17.63</td> <td></td> <td></td> <td>4.1</td> <td>1.30</td> <td>0.86</td> <td>55</td> <td></td> <td>Start up again</td>		18.98	19.42	17.63			4.1	1.30	0.86	55		Start up again
13:20         19:24         19:76         17.7         4.5         1.60         1.05           14:00         19:25         19:75         17:69         4.8         1.65         1.05           16:30         19:25         19:75         17:74         13:76         4.8         1.65         1.05           16:30         19:28         19:84         17.76         5         1.85         1.15         5           9:10         19:28         19:84         17.76         5         1.85         1.15         50           9:10         19:27         19:86         17:81         8.5         5.10         3.90         50           10:45         19:3         17:87         8.5         5.10         3.80         50           10:45         19:29         17:87         8.5         5.10         3.80         50           10:15         19:21         19:31         17:85         8.5         4.90         3.65           10:15         19:21         19:31         17:72         8.6         4.60         3.70         50           10:30         18:48         19:18         17.72         19:1         19:2         19:2         19:2		19.19	19.66	17.66			4.5	1.60	1.02			
14:00         19.25         19.75         17.69         4.8         1.65         1.05           16:30         19.29         19.82         17.74         13.76         4.95         1.75         1.10           17:30         19.28         19.84         17.76         3.76         5         1.85         1.15           9:10         19.27         19.86         17.81         4.85         1.85         1.25         50           16:15         19.28         19.9         17.84         5.6         2.70         1.90         50           10:45         19.3         17.87         8.5         5.10         3.80         50           10:45         19.29         17.87         8.5         4.90         3.65         50           10:15         19.21         19.83         17.82         8.5         4.90         3.65         50           10:15         19.21         19.83         17.72         8.6         4.60         3.70         50           10:20         19.21         19.18         17.72         19.1         17.72         19.1         19.2         19.2         19.2         19.2         19.2         19.2         19.2         19.2		19.24	19.76	17.7			4.5	1.60	1.05			
16:30         19:29         19:82         17.74         13.76         4.95         1.75         1.10           17:30         19:28         19:84         17.76         5         1.85         1.15         5           9:10         19:27         19:86         17.81         4.85         1.85         1.25         50           16:15         19:28         19:9         17.84         8.5         2.70         1.90         8           8:15         19:28         19:9         17.87         8.5         5.10         3.80         50           10:45         19:29         17.87         8.7         5.10         3.80         50           15:45         19:27         19:9         17.82         8.5         4.90         3.65           10:15         19:21         19:83         17.82         8.6         4.60         3.70         50           15:30         18:48         19:18         17.72         8.6         4.60         3.70         50		19.25	19.75	17.69			4.8	1.65	1.05			new well head 2" straw
17:30         19:28         19:84         17.76         5         1.85         1.15         6           9:10         19:27         19:86         17:81         4.85         1.85         1.25         50           16:15         19:28         19:3         17:84         5.6         2.70         1.90         7           8:15         19:28         17:86         8.5         5.10         3.80         50           10:45         19:29         17:87         8.7         5.10         3.80         50           15:45         19:27         19:93         17:85         8.5         4.90         3.65         8           10:15         19:21         19:83         17:82         8.6         4.60         3.70         50           15:30         18:48         19:18         17.72         8.6         4.60         3.70         50		19.29	19.82	17.74	13.76		4.95	1.75	1.10			
9:10         19:27         19:86         17:81         4.85         1.85         1.25         50           16:15         19:28         17:84         5.6         2.70         1.90         50           8:15         19:28         19:96         17:86         8.5         5.10         3.80         50           10:45         19:3         19:95         17:87         8.6         5.10         3.90         50           12:45         19:27         19:9         17:85         8.5         4.90         3.65         50           10:15         19:21         19:83         17:82         8.6         4.60         3.70         50           15:30         18:48         19:18         17.72         8.6         4.60         3.70         50		19.28	19.84	17.76			5	1.85	1.15			
16:15         19:28         19:9         17:84         5:6         2.70         1:90           8:15         19:3         19:96         17:86         8:5         5:10         3:80           10:45         19:3         19:95         17:87         8:6         5:10         3:90         50           12:45         19:29         19:93         17:87         8:7         5:10         3:80         50           15:45         19:27         19:9         17:85         8:5         4:90         3:65         50           10:15         19:21         19:83         17:82         8:6         4:60         3:70         50           15:30         18:48         19:18         17:72         8:6         4:60         3:70         50		19.27	19.86	17.81			4.85	1.85	1.25	20		Rain
8:15     19.3     19.96     17.86     8.5     5.10     3.80       10:45     19.3     17.87     8.6     5.10     3.90     50       12:45     19.29     19.93     17.87     8.7     5.10     3.80     50       15:45     19.27     19.9     17.82     8.5     4.90     3.65       10:15     19.81     17.72     8.6     4.60     3.70     50       15:30     18.48     19.18     17.72     7.72     7.72     7.72     7.72     7.72	,	19.28	19.9	17.84			9.6	2.70	1.90			
10:45     19.3     17.87     8.6     5.10     3.90     50       12:45     19.29     17.87     8.7     5.10     3.80     50       15:45     19.27     19.9     17.82     8.5     4.90     3.65       10:15     19.21     19.83     17.72     8.6     4.60     3.70     50       15:30     18.48     19.18     17.72     7.4		19.3	19.96	17.86			8.5	5.10	3.80			Rain
12:45         19:29         19:93         17:87         8.7         5.10         3.80           15:45         19:27         19:9         17.82         8.5         4.90         3.65           10:15         19:21         19:83         17.82         8.6         4.60         3.70         50           15:30         18:48         19:18         17.72         9         10         10         10		19.3	19.95	17.87			9.8	5.10	3.90	50		Rain
15:45     19:27     19:9     17.85     8.5     4.90     3.65       10:15     19:21     19:83     17.82     8.6     4.60     3.70     50       15:30     18:48     19:18     17.72     8.6     4.60     3.70     50		19.29	19.93	17.87			8.7	5.10	3.80			Rain
10:15     19.21     19.83     17.82     8.6     4.60     3.70     50       15:30     18.48     19.18     17.72     3.70     50		19.27	19.9	17.85			8.5	4.90	3.65			Rain
15:30 18:48 19.18 17.72		19.21	19.83	17.82			8.6	4.60	3.70	20		Mist
15:30 18:48 19:18 17.72												
20,01		18.48	19.18	17.72								Post test readings
10:30 18.17 18.9 17.48	5/26/96 10:30	18.17	18.9	17.48								Post test readings

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- Two (2) Phase Pilot Test (BG-04 Test)
Ellsworth Air Force Base - Two

# 2-PHASE System Operating Conditions Data Sheet

			Comments	Begin test	1-1/4" straw		restart with 1-1/2" straw					changed vacuum gauges						2" straw				Unit off from 4 AM to 8:30 AM	Restart				New well head 2" straw			Rain	Rain	Rain	Rain	Rain	Rain	Mist	Stopped test	
	Totalizer	Laguid	Volume (gal)		25960	26104		26190	26327	27015	28606	28903	29349	29767	29950	32163	32422	32498	32830	33254	34001	34734		34806	35161	35705		36220	36388	$\neg$		41840			42843		45299	1
		Aspir.	Flow (cfm)		2	4		2	2	2	2	2	0	0	0	. 0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0	0	0	0		1
-10		****	Flow (cfm)		10	13.5		13	14.5	91	17	17	17.3	17.3	17.5	18	20	20	20	20.5	20			24	25	76	28	30	29	27	28	28	27	28	78	28		
Exhaust Vapor			Pressure (DSD			1		1.2	1.5	1	2	2	1	1	2	2	1	1	1	1	7			0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	I	2		_		
Exi			Temp. (deg F)		99	62		62	88	99	99	09	09	09	09	85	72	74	74	74	56			53	58	89	70	49	64	20	50	- 20	20	20	20	44		
	iio	Potential	Pressure (psl)		18	17		17	17	18	18	17	18	17.5	18	17	17	16	16	16	18			21	19	18	17	18	19	21	21	21	21	21	21	20.5		
Huid	iio		Temp.		163	176		177	176	176	176	176	178	178	180	176	179	179	178	177	177			174	176	176	178	176	180	176	176	176	176	176	176	175		
Seal Fluid	Pressure		Pump (psi)		-	1		-	1	2	1	0	2	1	1	1	0	1	1	1	2			2	1		. 1	1	1	1	1	1	1	1	1	1		1
		••••	Temp. (deg F)		160	172		174	174	172	170	170	176	176	178	172	171	172	172	171	173			157	158	168	168	170	170	160	158	160	162	158	162	163		
lead		Well	Vacuum (in. Hg)		10	11		12	12	13	13.5	13.5	14	13.8	14	14	14	13.5	13.5	13.5	14			6	10.5	. 11	10	10	10	12	12	12	13	13	13	12		
Wellhead	Top of	Stran	Vacuum (in. Hg)		19.0	19.0		19.0	19.0	19.0	19.0	19.0	19.0	19.3	19.7	19.5	20.0	20.0	20.5	20.0	20.0			15.5	16.5	17.5	•	1	-	,	-		-	•	-			
System Inlet			Vacuum (in. Hg)		26.0	25.0		25.5	25.0	25.0	24.5	25.0	23.5	23.5	23.5	23.5	23.5	23.8	23.8	23.5	23.5			23.0	23.0	23.0	23.0	23.0	23.0	23.0	22.5	23.0	23.0	23.0	23.0	23.0		
Syste			Temp. (deg F)		40	40		36	36	35	36	36	36	36	36	36	36	36	36	36	36		•	•		•	,		-	•	•	•	•	1	-	•		
	ı		Operating Hours	T	2685.4	2686.1		. 2686.5	2687.1	2690.9	2700.7	2702.64	2705.39	2708.34	2709.63	2726.12	2728.04	2728.61	2731.34	2734.13	2739.89	2745.5	2745.74	2746.01	2747.74	2750.85	2751.53	2754.05	2755.06	2771.11	2778.28	2794.85	2797.36	2799.64	2802.52	2821.64	2821.83	
			Time (	16:07	16:25	17:07	17:12	17:27	18:05	21:40	7:20	9:10	11:55	14:50	16:00	8:05	10:05	10:30	13:00	16:00	21:30	8:15	8:30	8:45	10:25	13:25	14:05	16:30	17:30	9:15	16:15	8:15	10:45	12:45	15:45	10:15	10:30	1
			Date	9//61/9	96/61/9	96/61/9	96/61/9	96/61/9	96/61/9	96/61/9	96/07/5	2/20/96	5/20/96	5/20/96	96/07/5	2/21/96	5/21/96	5/21/96	5/21/96	. 5/21/96	5/21/96	5/22/96	5/22/96	5/22/96	5/22/96	5/22/96	5/22/96	5/22/96	5/22/96	5/23/96	2/23/96	5/24/96	5/24/96	5/24/96	5/24/96	5/25/96	5/25/96	

Extracted Liquid   Extracted   Equid Daylicate   Blank   SW-826086015M   AM4.02   SW-826086015M   X   AM4.02	EII	Ellsworth Air Fo	Force Base - Two (2) Phase Pilot Test (BG-04 Test) Analytical Sampling Field Data Sheet	Two (2) H impling Fie	hase Pilo Id Data Sh	it Test (B eet	G-04 Test)			
Extracted Education   Extracted   Equition   Extracted   Equition   Extracted Education   Extracted Education   Extracted Education   Extracted Education   Educ										Liquid Phase
Time         SW-8260/8015M         AM4.02         SW-8260/8015M         AM4.02         AM2.02         AM2.02         AM2.02         AM2.02	•		Extracted		Liquid Trip	Vapor	Vapor Trip			Carbon Effluent
Time         SW-8260/8015M         AM4.02         SW-8260/8015M         AM4.02         AM4.02           17:00         X         X         X         X           14:40         Effluent disch #2         Vapor 2         X         X           18:12         Effluent disch #3         Vapor 4         X         X           14:50         Effluent disch #4         Vapor 5         X         X           8:15         Effluent disch #5         Vapor 6         X         X           10:00         Effluent disch #7         Vapor 7D         X         X           10:00         Effluent disch #1         Vapor 9         X         X           10:00         Effluent disch #1         Vapor 10         X         X           10:00         Effluent disch #1         Vapor 10         X         X           10:01         Effluent disch #1         Vapor 10         X         X           10:45         Effluent disch #12         Vapor 12         X         X           10:10         Effluent disch #13         Vapor 13         X         X           10:10         Effluent disch #13         Vapor 13         X         X           10:10         Effluent disch #13		Extracted Liqui		Liquid Duplicate	Blank	Duplicate	Blank	Groundwater	Soil Vapor	(Storage Tank)
17:00         X           14:40         Effluent disch #2         Vapor 2           18:12         Effluent disch #2         Vapor 2           7:35         Effluent disch #3         Vapor 4           8:15         Effluent disch #4         Vapor 5           15:45         Effluent disch #7         Vapor 70           10:00         Effluent disch #7         Vapor 7D           10:00         Effluent disch #8         Vapor 7D           10:00         Effluent disch #8         Vapor 9           9:20         Effluent disch #1         Vapor 10           16:15         Effluent disch #1         Vapor 11           10:45         Effluent disch #1         Vapor 12           10:45         Effluent disch #1         Vapor 12           10:10         Effluent disch #13         Vapor 12           10:10         Effluent disch #13         Vapor 12           10:10         Effluent disch #13         Vapor 12	Date Ti			SW-8260/8015M	SW-8260	AM4.02	AM4.02	SW-8260/8015M	AM4.02	SW-8260
Vapor 1       X       X         Vapor 2       X       X         Vapor 4       X       X         Vapor 5       X       X         Vapor 7       X       X         Vapor 8       X       X         Vapor 9       X       X         Vapor 10       X       X         Vapor 11       X       X         Vapor 12       X       X         Vapor 13       X       X         Vapor 13       X       X	5/16/96	17:00			X			EW-2 Pre Test		
18:12 Effluent disch #2       Vapor 2       X       Peffluent disch #3       Vapor 3       X       Peffluent disch #4       Vapor 4       X       Peffluent disch #4       Vapor 5       Peffluent disch #5       Vapor 6       Peffluent disch #6       Vapor 7       Peffluent disch #7       Vapor 7       X       X       Peffluent disch #8       Vapor 9       Peffluent disch #9       Vapor 10       Peffluent disch #1       Vapor 10       Peffluent disch #1       Vapor 11       X       Peffluent disch #1       Vapor 11       X       Peffluent disch #1       Vapor 12       Peffluent disch #1       Vapor 12       Peffluent disch #1       Vapor 13       Peffluent disch #1       Vapor 13       Peffluent disch #1       Vapor 13       Peffluent disch #1       Vapor 12       Peffluent disch #1       Vapor 13       Vapor 13       Vapor 13       Vapor 13       Vapor 13       Vapor		14:40 Effluent disch #1	Vapor 1							
7:35 Effluent disch #3       Vapor 3       X         14:50 Effluent disch #4       Vapor 4       X         8:15 Effluent disch #5       Vapor 6       X         10:00 Effluent disch #7       Vapor 7D       X         10:00 Effluent disch #7       Vapor 7D       X         10:00 Effluent disch #7       Vapor 8       X         16:00 Effluent disch #8       Vapor 9       X         16:01 Effluent disch #10 Vapor 10       X       X         10:15 Effluent disch #11 Vapor 11       X       X         10:45 Effluent disch #12 Vapor 12       X       X         10:10 Effluent disch #13 Vapor 13       X       X         10:10 Effluent disch #13 Vapor 13       X       X		18:12 Effluent disch #2	Vapor 2		-					
14:50       Effluent disch #4       Vapor 4       Permet disch #5       Vapor 5       Permet disch #5       Vapor 6       Permet disch #7       Vapor 7       Napor 10:00       Effluent disch #7       Vapor 7D       Napor 10       Napor 10       Napor 10       Napor 10       Napor 10       Napor 10       Napor 11       Napor 11       Napor 12       Napor 13	96/07/	7:35 Effluent disch #3	Vapor 3		X					
8:15 Effluent disch #5       Vapor 5       (Apor 5)       (Apor 6)       (Apor 6)       (Apor 7)       (Apor 8)       (Apor 8)       (Apor 8)       (Apor 8)       (Apor 8)       (Apor 10)       (Apor 10)       (Apor 10)       (Apor 10)       (Apor 10)       (Apor 11)       (Apor 12)       (Apor 12)       (Apor 12)       (Apor 12)       (Apor 12)       (Apor 13)       (Apor 14)       (Apor 15)       (Apor 15)       (Apor 15)       (Apor 15)       (Apor 15)       (Apor 15)       (Apor 16)       (Apor 16)       (Apor 17)		14:50 Effluent disch #4	Vapor 4							
15:45 Effluent disch #6       Vapor 6         10:00       Effluent disch #7       Vapor 7D       X         10:00       Effluent disch #7       Vapor 8       X         16:00       Effluent disch #8       Vapor 9         9:20       Effluent disch #10       Vapor 10         16:15       Effluent disch #11       Vapor 10         10:45       Effluent disch #12       Vapor 12         10:10       Effluent disch #13       Vapor 13         10:10       Effluent disch #13       Vapor 13         11:10       EW-2 Post Test       X	/21/96	8:15 Effluent disch #5	Vapor 5							
10:00       Effluent disch #7       Vapor 7D       X       X         10:00       Effluent disch #8       Vapor 8       X       X         16:00       Effluent disch #9       Vapor 9       X       X         16:15       Effluent disch #10       Vapor 10       X       X         10:45       Effluent disch #11       Vapor 12       X       X         10:10       Effluent disch #13       Vapor 13       X       X         11:10       EW-2 Post Test       X       X		15:45 Effluent disch #6	Vapor 6							
10:00       Effluent disch #7D       Vapor 7D       X       X         16:00       Effluent disch #8       Vapor 8       X       X         9:20       Effluent disch #10       Vapor 10       X       Effluent disch #11         10:45       Effluent disch #12       Vapor 11       X       Effluent disch #12         10:10       Effluent disch #13       Vapor 13       X       Effluent disch #13         11:10       EW-2 Post Test       X       X		10:00 Effluent disch #7								
16:00 Effluent disch #8       Vapor 8       X         9:20 Effluent disch #10       Vapor 9       Carrier Rein Rein Rein Rein Rein Rein Rein Rein		10:00 Effluent disch #7]		X		X				
9:20 Effluent disch #9       Vapor 9         16:15 Effluent disch #10       Vapor 10         10:45 Effluent disch #11       Vapor 11         15:45 Effluent disch #12       Vapor 12         10:10 Effluent disch #13       Vapor 13         11:10 EW-2 Post Test       X		16:00 Effluent disch #8			X					
16:15 Effluent disch #10       Vapor 10         10:45 Effluent disch #11       Vapor 11         15:45 Effluent disch #12       Vapor 12         10:10 Effluent disch #13       Yapor 13         11:10 EW-2 Post Test       X	/23/96	9:20 Effluent disch #9								
10:45 Effluent disch #11       Vapor 11       X       A         15:45 Effluent disch #12       Vapor 12       A       A         10:10 Effluent disch #13       Vapor 13       A       A         11:10 EW-2 Post Test       X       A		16:15 Effluent disch #10								
15:45 Effluent disch #12       Vapor 12         10:10 Effluent disch #13       Vapor 13         11:10 EW-2 Post Test       X		10:45 Effluent disch #1			X			•		
10:10 Effluent disch #13 Vapor 13       X         11:10 EW-2 Post Test       X		15:45 Effluent disch #1.	2   Vapor 12							
11:10 EW-2 Post Test X		10:10 Effluent disch #1.								
		11:10 EW-2 Post Test			×			EW-2 Post Test	^	

APPENDIX C

**Groundwater Sample Analytical Data** 



# **ENERGY LABORATORIES, INC.**

P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225 610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

James Machin **Radian Corporation** P.O. Box 201088 Austin, TX 78720-1088

Ellsworth AFB, BG-04

June 4, 1996 96-23463-65 Submitted: 05-20-96

Sampled: 05-19/20-96

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed	

### Water Analysis

BG-04 Effluent #1

96-23463 8260 LONG

-96

			RH:05-31-9
	<u>μg/L</u>	POL	
1,1-Dichloroethene	<1.0	1.0	
Methylene Chloride	<1.0	1.0	
trans-1,2-Dichloroethene	<1.0	1.0	
1,1-Dichloroethane	<1.0	1.0	
2,2-Dichloropropane	<1.0	1.0	
cis-1,2-Dichloroethene	<1.0	1.0	
Bromochloromethane	<1.0	1.0	
Chloroform	<1.0	1.0	
1,1,1-Trichloroethane	<1.0	1.0	
Carbon Tetrachloride	<1.0	1.0	
1,1-Dichloropropene	<1.0	1.0	
Benzene	<1.0	1.0	
1,2-Dichloroethane	<1.0	1.0	
Trichloroethene	3.3	1.0	
1,2-Dichloropropane	<1.0	1.0	
Dibromomethane	<1.0	1.0	
Bromodichloromethane	<1.0	1.0	
Trans-1,3-Dichloropropene	<1.0	1.0	
Toluene	<1.0	1.0	
cis-1,3-Dichloropropene	<1.0	1.0	
1,1,2-Trichloroethane	<1.0	1.0	
Tetrachloroethene	<1.0	1.0	
1,3-Dichloropropane	<1.0	1.0	
Dibromochloromethane	<1.0	1.0	
1,2-Dibromoethane	<1.0	1.0	
Chlorobenzene	<1.0	1.0	
1,1,1,2-Tetrachloroethane	<1.0	1.0	
Ethylbenzene	<1.0	1.0	
M+P Xylenes	<1.0	1.0	
O-Xylene	<1.0	1.0	
Styrene	<1.0	1.0	
Bromoform	<1.0	1.0	
Isopropylbenzene	<1.0	1.0	
Bromobenzene	<1.0	1.0	
1,1,2,2-Tetrachloroethane	<1.0	1.0	
1,2,3-Trichloropropane	<1.0	1.0	
n-Propylbenzene	<1.0	1.0	
2-Chlorotoluene	<1.0	1.0	
4-Chlorotoluene	<1.0	1.0	
1,3,5-Trimethylbenzene	<1.0	1.0	
tert-Butylbenzene	<1.0	1.0	
1,2,4-Trimethylbenzene	<1.0	1.0	
sec-Butylbenzene	<1.0	1.0	
1,3-Dichlorobenzene	<1.0	1.0	
1,4-Dichlorobenzene	<1.0	1.0	
p-Isopropyltoluene	<1.0	1.0	
1,2-Dichlorobenzene	<1.0	1.0	
n-Butylbenzene	<1.0	1.0	
1,2-Dibromo-3-Chloropropane	<1.0	1.0	
1,2,4-Trichlorobenzene	<1.0	1.0	
Naphthalene	<1.0	1.0	
Hexachlorobutadiene	<1.0	1.0	

Page 2 of 6

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
3G-04 Efflu	rent #1	96-23463	8260 LONG				RH:05-31-9
					<u>ν</u> α/L	<u>PQL</u>	
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	<20	20	
				Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	< 1.0	1.0	
			·	lodomethane	<1.0	1.0	
		;	Surrogate Recoveries				
			ė.	1,2-Dichloroethane-d4	101	%	Recovery
				Toluene-d8	100		
				4-Bromofluorobenzene	103		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
G-04 Effluent	t #2	96-23464	8260 LONG				RH:05-31-
					<u>μ</u> g/L	POL	
				1,1-Dichloroethene Methylene Chloride	<1.0 <1.0	1.0 1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0	1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
				1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride	<1.0	1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane Trichloroethene	<1.0 2.9	1.0 1.0	
				1,2-Dichloropropane	<1.0	1.0	
				Dibromomethane	<1.0	1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene cis-1,3-Dichloropropene	<1.0 <1.0	1.0 1.0	
				1,1,2-Trichloroethane	<1.0	1.0	
		•		Tetrachloroethene	<1.0	1.0	•
				1,3-Dichloropropane	<1.0	1.0	
				Dibromochloromethane	<1.0	1.0	
				1,2-Dibromoethane Chlorobenzene	<1.0 <1.0	1.0 1.0	
				1,1,1,2-Tetrachioroethane	<1.0	1.0	
				Ethylbenzene	<1.0	1.0	
				M+P Xylenes	<1.0	1.0	
			•	O-Xylene	<1.0	1.0	
				Styrene Bromoform	<1.0 <1.0	1.0 1.0	
				Isopropylbenzene	<1.0	1.0	
				Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane	<1.0	1.0	
				1,2,3-Trichloropropane	<1.0	1.0	
				n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
				4-Chlorotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene	<1.0	1.0	
			-	1,2,4-Trimethylbenzene	<1.0	1.0	
				sec-Butylbenzene 1,3-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
				p-Isopropyltoluene	<1.0	1.0	
				1,2-Dichlorobenzene	<1.0	1.0	
				n-Butylbenzene	<1.0	1.0	
			•	1,2-Dibromo-3-Chloropropan 1,2,4-Trichlorobenzene	e <1.0 <1.0	1.0 1.0	
				· Naphthalene	<1.0	1.0	
				Hexachlorobutadiene	<1.0	1.0	
				1,2,3-Trichlorobenzene	<1.0	1.0	-
				Acetone Methyl Ethyl Ketone	<20 <10	20 10	
				Methyl Ethyl Ketone Dichlorodifluoromethane	<1.0 <1.0	10 1.0	
			•	Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein Acrylonitrile	<10 <10	10 10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				lodomethane	<1.0	1.0	
		;	Surrogate Recoveries	1 2 Diablemethan dd	100	^,	Pagovere
				1,2-Dichloroethane-d4 Toluene-d8	100 104	%	Recovery
				I CIGGIRC-GO	104		

		Lab No.	Methodology	Analysis	Results	Units	Analyzed
			,				
-04 Effluent	t #3		8260 LONG				RH:05-3
					<u>µg/L</u>	POL	
				1,1-Dichloroethene	<1.0	1.0	
				Methylene Chloride trans-1,2-Dichloroethene	<1.0 <1.0	1.0 1.0	
			•	1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0	1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
				1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride	<1.0	1.0	
				1,1-Dichloropropene Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0 <1.0	1.0 1.0	
				Trichloroethene	2.5	1.0	
				1,2-Dichloropropane	<1.0	1.0	
				Dibromomethane Bromodichloromethane	<1.0 <1.0	1.0 1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene	<1.0	1.0	
				cis-1,3-Dichloropropene	<1.0	1.0	
				1,1,2-Trichloroethane Tetrachloroethene	<1.0 <1.0	1.0 1.0	
				1,3-Dichloropropane	<1.0	1.0	
				Dibromochloromethane	<1.Ó	` 1.0	•
		•		1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene 1,1,1,2-Tetrachioroethane	<1.0 <1.0	1.0 1.0	
				Ethylbenzene	<1.0	1.0	
				M+P Xylenes	<1.0	1.0	
				O-Xylene Styrene	<1.0 <1.0	1.0 1.0	
			•	Bromoform	<1.0	1.0	
				Isopropylbenzene	<1.0	1.0	
				Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
				n-Propylbenzene	<1.0	1.0	
				2-Chlorotoluene	<1.0	1.0	
				4-Chlorotoluene 1,3,5-Trimethylbenzene	<1.0 <1.0	1.0 1.0	
				tert-Butylbenzene	<1.0	1.0	
				1,2,4-Trimethylbenzene	<1.0	1.0	
				sec-Butylbenzene 1,3-Dichlorobenzene	<1.0 <1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0 1.0	
				p-Isopropyltaluene	<1.0	1.0	
				1,2-Dichlorobenzene	<1.0	1.0	
				n-Butylbenzene 1,2-Dibromo-3-Chloropropane	<1.0 e <1.0	1.0 1.0	
				1,2,4-Trichlorobenzene	<1.0	1.0	
			•	Naphthalene	<1.0	1.0	•
				Hexachlorobutadiene 1,2,3-Trichlorobenzene	<1.0 <1.0	1.0 1.0	
				Acetone	<20	20	
				Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane Chloromethane	<1.0 <1.0	1.0 1.0	
			•	Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				. Methyl Isobutyl Ketone 2-Hexanone	<10 <10	10 10	
			•	Acrolein	<10	10	
				Acrylonitrile	<10	10	•
				Methyltertiary Butyl Ether	<1.0	1.0	
			Surrogate Recoveries	lodomethane	<1.0	1.0	
		. 1		1,2-Dichloroethane-d4	109	,	% Recovery
		1/1/	11	Toluene-d8	100		•
		" (/X)	111	4-Bromofluorobenzene	102		

C-4

Method Blank	8260 LONG		μg/L	PQL	RH:05-31-96
		1,1-Dichloroethene	<1.0	1.0	1111.00-01-00
		Methylene Chloride	<1.0	1.0	
	•	trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
<b>S</b>		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene 1,2-Dichloroethane	<1.0 <1.0	1.0	
		Trichloroethene	<1.0	1.0 1.0	
		1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
	•	Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0	1.0	
		1,2-Dibromoethane	<1.0	1.0	
		Chlorobenzene 1,1,1,2-Tetrachloroethane	<1.0 <1.0	1.0 1.0	
		Ethylbenzene	<1.0	1.0	
		M+P Xylenes	<1.0	1.0	
	•	O-Xylene	<1.0	1.0	
		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene	<1.0	1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene 1,2-Dichlorobenzene	<1.0	1.0 1.0	
		n-Butylbenzene	<1.0 <1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone	<10	10	
•		Dichlorodifluoromethane Chloromethane	<1.0	1.0	-
		Vinyl Chloride	<1.0 <1.0	1.0 1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	•
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
		Acrolein	<10 <10	10 10	
		Acrylonitrile Methyltertiary Butyl Ether	<1.0	1.0	
		fodomethane	<1.0	1.0	
	Surrogate Recoveries				
	<b>-</b> · · · · · · · · · · · · · · · · ·	1,2-Dichloroethane-d4	92	. % Reco	very
		Toluene-d8	108		
·		4-Bromofluorobenzene	107		
		C-5			
		~ ·			

Trip Blank	8260 LONG		μg/L	PQL	RH:05-31-96
•		1,1-Dichloroethene	<1.0	1.0	
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	•
		Bromochloromethane	<1.0	1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane Carbon Tetrachloride	<1.0 <1.0	1.0 1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene	<1.0	1.0	
		1,2-Dichloroethane	<1.0	1.0	,
		Trichloroethene	<1.0	1.0	
	•	1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
•		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene 1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0 <1.0	1.0 1.0	
		1,2-Dibromoethane	<1.0	1.0	
		Chlorobenzene	<1.0	1.0	
•		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M+P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1,0	
		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
•		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
		1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
		n-Propylbenzene	<1.0	1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene	<1.0	1.0	
•		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
		p-Isopropyltoluene 1,2-Dichlorobenzene	<1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
	•	1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone	<10	10	
. •		Dichlorodifluoromethane Chloromethane	<1.0 <1.0	1.0	
		Vinyl Chloride	<1.0	1.0 1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
•		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	:
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
·		Acrolein	<10	10	
	•	Acrylonitrile Methyltertiary Butyl Ether	<10 <1.0	10 1.0	
		lodomethane	<1.0 <1.0	1.0	•
	Surrogate Recoveries		~ 1.0		
	<b>Q</b>	1,2-Dichloroethane-d4	89	% Red	covery
		Toluene-d8	107		
		4-Bromofluorobenzene	109		



### **ENERGY LABORATORIES, INC.**

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James Machin Radian Corporation P.O. Box 201088 Austin, TX 78720-1088

Ellsworth AFB BG-04

Sampled: 05-20/21/22-96

June 5, 1996 96-23546-51

Submitted: 05-23-96

					•		
Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

### Water Analysis

BG-04 Effluent #4

96-23546 8260 LONG

RH:05-31-96

	μ <u>α</u> /L	POL	
1,1-Dichloroethene	<1.0	1.0	
Methylene Chloride	< 1.0	1.0	
trans-1,2-Dichloroethene	<1.0	1.0	
1,1-Dichloroethane	< 1.0	1.0	
2,2-Dichloropropane	<1.0	1.0	
cis-1,2-Dichloroethene	<1.0	1.0	
Bromochloromethane	< 1.0	1.0	
Chloroform	< 1.0	1.0	
1,1,1-Trichloroethane	<1.0	1.0	
Carbon Tetrachloride	< 1.0	1.0	
1,1-Dichloropropene	< 1.0	1.0	
Benzene	< 1.0	1.0	
1,2-Dichloroethane	< 1.0	1.0	
Trichloroethene	2.5	1.0	
1,2-Dichloropropane	< 1.0	1.0	
Dibromomethane	< 1.0	1.0	
Bromodichloromethane	<1.0	1.0	
Trans-1.3-Dichloropropene	< 1.0	1.0	
Toluene	< 1.0	1.0	
cis-1,3-Dichloropropene	<1.0	1.0	
1,1,2-Trichloroethane	<1.0	1.0	
Tetrachloroethene	<1.0	1.0	
1,3-Dichloropropane	< 1.0	1.0	
Dibromochloromethane	< 1.0	1.0	
1.2-Dibromoethane	<1.0	1.0	
Chlorobenzene	<1.0	1.0	
1.1.1.2-Tetrachloroethane	< 1.0	1.0	
Ethylbenzene	<1.0	1.0	
M+P Xylenes	<1.0	1.0	
0-Xylene	<1.0	1.0	
Styrene	<1.0	1.0	
Bromoform	<1.0	1.0	
Isopropylbenzene	<1.0	1.0	
Bromobenzene	<1,0	1.0	
1,1,2,2-Tetrachloroethane	<1.0	1.0	
1,2,3-Trichloropropane	<1.0	1.0	
n-Propylbenzene	<1.0	1.0	
2-Chlorotoluene	<1.0	1.0	
4-Chlorotoluene	<1.0	1.0	
1,3,5-Trimethylbenzene	<1.0	1.0	
tert-Butylbenzene	<1.0	1.0	
1,2,4-Trimethylbenzene	<1.0	1.0	
sec-Butylbenzene	<1.0	1.0	
1,3-Dichlorobenzene	<1.0	1.0	
1,4-Dichlorobenzene	<1.0	1.0	
	<1.0	1.0	
p-Isopropyitoluene 1,2-Dichlorobenzene	<1.0	1.0	
-	<1.0	1.0	
n-Butylbenzene			
1,2-Dibromo-3-Chloropropane	<1.0	1.0	
1,2,4-Trichlorobenzene	<1.0	1.0	-
Naphthalene Hexachlorobutadiene	<1.0 <1.0	1.0 1.0	
пехастногооцациене	< 1.0	1.0	

Site	Depth Lab No.	Methodology	Analysis	Results	Units	Analyzed
G-04 Effluent #4	96-23546	8260 LONG				RH:05-31-9
				μg/L	<u>PQL</u>	
			1,2,3-Trichlorobenzene	<1.0	1.0	
			Acetone	<20	20 ·	
			Methyl Ethyl Ketone	<10	10	
			Dichlorodifluoromethane	<1.0	1.0	
			Chloromethane	<1.0	1.0	
			Vinyl Chloride	< 1.0	1.0	
			Bromomethane	<1.0	1.0	•
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane	< 1.0	1.0	
			2-Chloroethylvinylether	<1.0	1.0	
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate	<1.0	1.0	
			Methyl Isobutyl Ketone	<10	10	
			2-Hexanone	<10	10	
			Acrolein	<10	10	
			Acrylonitrile	<10	10	
			Methyltertiary Butyl Ether	<1.0	1.0	
			lodomethane	<1.0	1.0	
		Surrogate Recoveries				
			1,2-Dichloroethane-d4	99	%	Recovery
			Toluene-d8	105		
			4-Bromofluorobenzene	103	•	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
			0000 1 0110				
-04 Effluent #5	, 9	6-23547	8260 LONG		<u>μη/L</u>	PQL	RH:06-03
			•	1,1-Dichloroethene	<1.0	1.0	
			,	Methylene Chloride	<1.0	1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane 2,2-Dichloropropane	<1.0 <1.0	1.0 1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane	<1.0	1.0	
				Chloroform	<1.0	1.0	
				1,1,1-Trichloroethane Carbon Tetrachloride	<1.0 <1.0	1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
•				Trichloroethene 1,2-Dichloropropane	2.0 <1.0	1.0 1.0	
				Dibromomethane	<1.0	1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene Toluene	<1.0 <1.0	1.0	
				cis-1,3-Dichloropropene	<1.0	1.0 1.0	
				1,1,2-Trichloroethane	<1.0	1.0	
				Tetrachloroethene	<1.0	1.0	
				1,3-Dichloropropane Dibromochloromethane	<1.0 <1.0	1.0 1.0	
				1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene	<1.0	1.0	
				1,1,1,2-Tetrachloroethane	<1.0	1.0	
		•		Ethylbenzene M+P Xylenes	<1.0 <1.0	1.0 1.0	
				O-Xylene	<1.0	1.0	
				Styrene	<1.0	1.0	
				Bromoform Isopropylbenzene	<1.0 <1.0	1.0 1.0	
			•	Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane	<1.0	1.0	
				1,2,3-Trichloropropane	<1.0	1.0	
				n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
				4-Chlorotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene 1,2,4-Trimethylbenzene	<1.0 <1.0	1.0 1.0	
				sec-Butylbenzene	<1.0	1.0	
				1,3-Dichlorobenzene	<1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
•				p-lsopropyltoluene 1,2-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
				n-Butylbenzene	<1.0	1.0	
				1,2-Dibromo-3-Chloropropan		1.0	
				1,2,4-Trichlorobenzene Naphthalene	<1.0 <1.0	1.0 1.0	
				Hexachlorobutadiene	<1.0	1.0	
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	<20	20	
				Methyl Ethyl Ketone Dichlorodifluoromethane	<10 <1.0	10 1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane Chloroethane	<1.0 <1.0	1.0 1.0	
				Trichlorofluoromethane	<1.0	1.0	
	•		•	2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate Methyl Isobutyl Ketone	<1.0 <10	1.0 10	
				2-Hexanone	<10	10	
		•		Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether lodomethane	<1.0 <1.0	1.0 1.0	
			•			•	
			Surrogate Recoveries	e o problema			0
				1,2-Dichloroethane-d4 Toluene-d8	98 103	%	Recovery
				4-Bromofluorohenzene	103		

103

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
G-04 Effluent #6	0.	6-23548	8260 LONG				
3-04 Ettidetic #0	3	0-23346	0200 LONG		<u>μ</u> g/L_	PQL	RH:06-03-
				1,1-Dichloroethene	<1.0	1.0	
				Methylene Chloride	<1.0	1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane 2,2-Dichloropropane	<1.0	1.0	
				cis-1,2-Dichloroethene	<1.0 <1.0	1.0 1.0	
				Bromochloromethane	<1.0	1.0	
				Chloroform	<1.0	1.0	
				1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride 1,1-Dichloropropene	<1.0 <1.0	1.0 1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
				Trichloroethene	2.0	1.0	
			·	1,2-Dichloropropane Dibromomethane	<1.0	1.0	
				Bromodichloromethane	<1.0 <1.0	1.0 1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene	<1.0	1.0	,
				cis-1,3-Dichloropropene	<1.0	1.0	
•				1,1,2-Trichloroethane Tetrachloroethene	<1.0 <1.0	1.0	
				1,3-Dichloropropane	<1.0	1.0 1.0	
			*	Dibromochloromethane	<1.0	1.0	
				1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene	<1.0	1.0	
				1,1,1,2-Tetrachloroethane Ethylbenzene	<1.0 <1.0	1.0 1.0	
				M+P Xylenes	<1.0	1.0	
				O-Xylene	<1.0	1.0	
				Styrene	<1.0	1.0	
			•	Bromoform Isopropylbenzene	<1.0 <1.0	1.0 1.0	
			3	Bromobenzene	<1.0	1.0	
			,	1,1,2,2-Tetrachloroethane	<1.0	1.0	
				1,2,3-Trichloropropane n-Propylbenzene	<1.0 <1.0	1.0	•
				2-Chlorotoluene	<1.0	1.0 1.0	
				4-Chlarotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene 1,2,4-Trimethylbenzene	<1.0	1.0	
			•	sec-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,3-Dichlorobenzene	<1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
			· •	p-Isopropyltoluene	<1.0	1.0	
				1,2-Dichlorobenzene n-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,2-Dibromo-3-Chloropropane		1.0	•
				1,2,4-Trichlorobenzene	<1.0	1.0	
				Naphthalene Hayachlarahutadiana	<1.0	1.0	
				Hexachlorobutadiene 1,2,3-Trichlorobenzene	<1.0 <1.0	1.0 1.0 -	
				Acetone	<20	20	
		÷		Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane Vinyl Chloride	<1.0 <1.0	1.0 1.0	
			,	Bromomethane	<1.0	1.0	
		•		Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether Carbon Disulfide	<1.0 <1.0	1.0 1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein Acrylonitrile	<10 <10	10 10	
				Methyltertiary Butyl Ether	· <1.0	1.0	
				lodomethane	<1.0	1.0	
			Surronate Recoveries				
			Surrogate Recoveries	1,2-Dichloroethane-d4	101	· %	Recovery
						,,,	•
				Toluene-d8	98		

Site	Depth Lab No.	Methodology	Analysis	Results	Units	Analyzed
3-04 Effluent #7	96-23549	8260 LONG	÷			RH:06-03-
3-04 Emuent #/	90-23549	0200 LONG		μg/L	PQL	KH:06-03-
			1,1-Dichloroethene	<1.0	1.0	
			Methylene Chloride	<1.0	1.0	
			trans-1,2-Dichloroethene	<1.0	1.0	
			1,1-Dichloroethane	<1.0	1.0	
			2,2-Dichloropropane	<1.0	1.0	
			cis-1,2-Dichloroethene	<1.0 <1.0	1.0 1.0	
			Bromochloromethane Chloroform	<1.0	1.0	
			1,1,1-Trichloroethane	<1.0	1.0	
			Carbon Tetrachloride	<1.0	1.0	
	*		1,1-Dichloropropene	<1.0	1.0	
			Benzene	<1.0	1.0	
			1,2-Dichloroethane	<1.0	1.0	
			Trichloroethene	2.5 <1.0	1.0 1.0	
			1,2-Dichloropropane Dibromomethane	<1.0	1.0	
			Bromodichloromethane	<1.0	1.0	
			Trans-1,3-Dichloropropene	<1.0	1.0	
			Toluene	<1.0	1.0	
			cis-1,3-Dichloropropene	<1.0	1.0	
			1,1,2-Trichloroethane	<1.0	1.0	
			Tetrachloroethene 1,3-Dichloropropane	<1.0 <1.0	1.0 1.0	
			Dibromochloromethane	<1.0	1.0	
			1,2-Dibromoethane	<1.0	1.0	
			Chlorobenzene	<1.0	1.0	
			1,1,1,2-Tetrachloroethane	<1.0	1.0	,
			Ethylbenzene	<1.0	1.0	
			M+P Xylenes	<1.0	1.0	
			O-Xylene Styrene	<1.0 <1.0	1.0 1.0	
			Bromoform	<1.0	1.0	
			Isopropylbenzene	<1.0	1.0	
			Bromobenzene	<1.0	1.0	
			1,1,2,2-Tetrachloroethane	<1.0	1.0	
			1,2,3-Trichloropropane	<1.0	1.0	
			n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
			4-Chlorotoluene	<1.0	1.0	
			1,3,5-Trimethylbenzene	<1.0	1.0	
			tert-Butylbenzene	<1.0	1.0	
			1,2,4-Trimethylbenzene	<1.0	1.0	
			sec-Butylbenzene	<1.0	1.0	
			1,3-Dichlorobenzene 1,4-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
			p-Isopropyltoluene	<1.0	1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
			n-Butylbenzene	<1.0	1.0	
			1,2-Dibromo-3-Chloropropar		1.0	
			1,2,4-Trichlorobenzene	<1.0	1.0	•
			Naphthalene Hexachlorobutadiene	<1.0 <1.0	1.0 1.0	
		•	1,2,3-Trichlorobenzene	<1.0	1.0	
			Acetone	<20	20	
			Methyl Ethyl Ketone	<10	10	
		•	Dichlorodifluoromethane	<1.0	1.0	
		•	Chloromethane	<1.0	1.0	
			-Vinyl Chloride Bromomethane	<1.0 <1.0	1.0 1.0	
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane	<1.0	1.0	
			2-Chloroethylvinylether	<1.0	1.0	
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate	<1.0	1.0	
			Methyl Isobutyl Ketone	<10	10 10	
•			2-Hexanone Acrolein	<10 <10	10 10	
			Acrolein Acrylanitrile	<10	10	
			Methyltertiary Butyl Ether	<1.0	1.0	
			lodomethane	<1.0	1.0	
		Surrogate Recoveries	1,2-Dichloroethane-d4	102	Q <sub>2</sub>	Recovery
	•		Toluene-d8	99	71	

Site	Depth Lab No.	Methodology	Analysis	Results	Units	Analyzed
G-04 Effluent #7	96-23550	8260 LONG				RH:06-03-
uplicate				μg/L	POL	NH:00-03-
			1,1-Dichloroethene	<1.0	1.0	
			Methylene Chloride	<1.0	1.0	
			trans-1,2-Dichloroethene 1,1-Dichloroethane	<1.0 <1.0	1.0 1.0	
			2,2-Dichloropropane	<1.0	1.0	
_			cis-1,2-Dichloroethene	<1.0	1.0	•
•			Bromochloromethane	<1.0	1.0	
			Chloroform 1,1,1-Trichloroethane	<1.0 <1.0	1.0 1.0	
			Carbon Tetrachloride	<1.0	1.0	
			1,1-Dichloropropene	<1.0	1.0	
			Benzene	<1.0	1.0	
			1,2-Dichloroethane	<1.0	1.0	
			Trichloroethene 1,2-Dichloropropane	2.5 <1.0	1.0 1.0	
			Dibromomethane	<1.0	1.0	
			Bromodichloromethane	<1.0	1.0	
			. Trans-1,3-Dichloropropene	<1.0	1.0	
	ì		Toluene cis-1,3-Dichloropropene	<1.0 <1.0	1.0 1.0	
	*		1,1,2-Trichloroethane	<1.0	1.0	
			Tetrachloroethene	<1.0	1.0	
			1,3-Dichloropropane	<1.0	1.0	
		•	Dibromochloromethane 1,2-Dibromoethane	<1.0 <1.0	1.0 1.0	
			Chlorobenzene	<1.0	1.0	
		•	1,1,1,2-Tetrachloroethane	<1.0	1.0	
			Ethylbenzene	<1.0	1.0	
			M+P Xylenes 0-Xylene	<1.0 <1.0	1.0 1.0	
			Styrene	<1.0	1.0	
			Bromoform	<1.0	1.0	
			Isopropylbenzene	<1.0	1.0	
			Bromobenzene 1,1,2,2-Tetrachloroethane	<1.0 <1.0	1.0 1.0	
			1,2,3-Trichloropropane	<1.0	1.0	
			n-Propylbenzene	<1.0	1.0	
			2-Chlorotoluene	<1.0	1.0	
			4-Chlorotoluene 1,3,5-Trimethylbenzene	<1.0 <1.0	1.0 1.0	
			tert-Butylbenzene	<1.0	1.0	
			1,2,4-Trimethylbenzene	<1.0	1.0	
			sec-Butylbenzene	<1.0	1.0	
			1,3-Dichlorobenzene 1,4-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
			p-Isopropyltoluene	<1.0	1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
			n-Butylbenzene	<1.0	1.0	
			1,2-Dibromo-3-Chloropropand 1,2,4-Trichlorobenzene	e <1.0 <1.0	1.0 1.0	
			Naphthalene	<1.0	1.0	
	•		Hexachlorobutadiene	<1.0	1.0	
			1,2,3-Trichlorobenzene	<1.0	1.0	
			Acetone Methyl Ethyl Ketone	<20 <10	20 10	
			Dichlorodifluoromethane	<1.0	1.0	
			Chloromethane	<1.0	1.0	
		,	Vinyl Chloride Bromomethane	<1.0 <1.0	1.0 1.0	
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane	<1.0	1.0	
			2-Chloroethylvinylether	<1.0	1.0	
			Carbon Disulfide Vinyl Acetate	<1.0 <1.0	1.0 1.0	
			Methyl Isobutyl Ketone	<1.0	1.0	
			2-Hexanone	<10	10	
			Acrolein	<10	10	
	•		Acrylonitrile	<10	10	
			Methyltertiary Butyl Ether lodomethane	<1.0 <1.0	1.0 1.0	
					•	
		Surrogate Recoveries	1 9 Disklassaka 44	400		Decement:
			1,2-Dichloroethane-d4 Toluene-d8	100 97	%	Recovery

Site	Depth Lab No.	Methodology	Analysis	Results	Units	Analyzed
04 Effluent #8	96-23551	8260 LONG		μ <u>g/L</u>	PQL	RH:06-03
			1,1-Dichloroethene	<1.0	1.0	
			Methylene Chloride	<1.0	1.0	
			trans-1,2-Dichloroethene 1,1-Dichloroethane	<1.0 <1.0	1.0 1.0	
		•	2,2-Dichloropropane	<1.0	1.0	
			cis-1,2-Dichloroethene	<1.0	1.0	
			Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
			1,1,1-Trichloroethane	<1.0	1.0	
			Carbon Tetrachloride	<1.0	1.0	
			1,1-Dichloropropene Benzene	<1.0 <1.0	1.0	
	•		1,2-Dichloroethane	<1.0	1.0 1.0	
			Trichloroethene	2.5	1.0	
			1,2-Dichloropropane	<1.0	1.0	
			Dibromomethane Bromodichloromethane	<1.0 <1.0	1.0 1.0	
			Trans-1,3-Dichloropropene	<1.0	1.0	
			Toluene	<1.0	1.0	
			cis-1,3-Dichloropropene 1,1,2-Trichloroethane	<1.0 <1.0	1.0 1.0	
			Tetrachloroethene	<1.0	1.0	
			1,3-Dichloropropane	<1.0	1.0	
			Dibromochloromethane 1,2-Dibromoethane	<1.0 <1.0	1.0 1.0	
			Chlorobenzene	<1.0	1.0	
			1,1,1,2-Tetrachloroethane	<1.0	1.0	
			Ethylbenzene M+P Xylenes	<1.0 <1.0	1.0 1.0	
		·	O-Xylene	<1.0	1.0	
			Styrene	<1.0	1.0	
			Bromoform	<1.0	1.0	
			Isopropyibenzene Bromobenzene	<1.0 <1.0	1.0 1.0	
			1,1,2,2-Tetrachioroethane	<1.0	1.0	
			1,2,3-Trichloropropane	<1.0	1.0	
			n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
			4-Chlorotoluene	<1.0	1.0	
			1,3,5-Trimethylbenzene	<1.0	1.0	
			tert-Butylbenzene 1,2,4-Trimethylbenzene	<1.0 <1.0	1.0 1.0	
			sec-Butylbenzene	<1.0	1.0	
		•	1,3-Dichlorobenzene	<1.0	1.0	
			1,4-Dichlorobenzene p-Isopropyltoluene	<1.0 <1.0	1.0 1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
		i e	n-Butylbenzene	<1.0	1.0	
			1,2-Dibromo-3-Chloropropane 1,2,4-Trichlorobenzene	<1.0 <1.0	1.0 1.0	
			Naphthalene	<1.0	1.0	
			Hexachlorobutadiene	<1.0	1.0	
			1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0 20	
			Methyl Ethyl Ketone	<10	10	
			Dichlorodifluoromethane	<1.0	- 1.0	
			Chloromethane Vinyl Chloride	<1.0 <1.0	1.0 1.0	
			Bromomethane	<1.0	1.0	
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate	<1.0	1.0	*
			Methyl Isobutyl Ketone 2-Hexanone	<10 <10	10 10	
			Acrolein	<10	10	
			Acrylonitrile	<10	10	
			Methyltertiary Butyl Ether lodomethane	<1.0 <1.0	1.0 1.0	
		Surrogate Recoveries	•			
		<b>,</b>	1,2-Dichloroethane-d4	105	9	6 Recovery
			Toluene-d8	102		

Kurt R. Slentz\_

Laboratory Manager

Method Blank	8260 LONG				
Wethod blank	8280 LUNG				RH:06-03-96
			<u>/1∖و</u>	PQL	
		1,1-Dichloroethene	<1.0	1.0	
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tetrachloride	<1.0	1.0	
		-1,1-Dichloropropene	<1.0	1.0	
		Benzene	<1.0	1.0	
		1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0	1.0	
	•	1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
	·	Bromodichloromethane	<1.0	1.0	
•		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	*
	t .	Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane 1,2-Dibromoethane	<1.0	1.0	
		•	<1.0	1.0	
		Chlorobenzene 1,1,1,2-Tetrachloroethane	<1.0	1.0	
			<1.0	1.0	
•		Ethylbenzene M + P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1.0	
	•	Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
	•	1,1,2,2-Tetrachloroethane	<1.0 <1.0	1.0 1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene	<1.0		
		2-Chlorotoluene	<1.0	1.0 1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene	<1.0	1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
•		p-isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene	<1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	٠,
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	< 1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
		Acrolein	<10	10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
	<b>6</b>	lodomethane	<1.0	1.0	
	Surrogate Recoveries	4 O Diablamatica 44	<b>a</b> 'a	<b>*</b> · =	
		1,2-Dichloroethane-d4	98	% R	ecovery
		Toluene-d8	104		
		4-Bromofluorobenzene	98		

Trip Blank	8260 LONG				RH:06-04-96
			<u>μg/L</u>	POL	
		1,1-Dichloroethene Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0 <1.0	1.0 1.0	
,		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene 1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0 <1.0	1.0 1.0	
		1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene Toluene	<1.0 <1.0	1.0 1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
	•	1,3-Dichloropropane Dibromochloromethane	<1.0 <1.0	1.0	
		1,2-Dibromoethane	<1.0	1.0 1.0	
		Chlorobenzene	<1.0	1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	w.
		Ethylbenzene	<1.0	1.0	
		M + P Xylenes O-Xylene	<1.0 <1.0	1.0 1.0	
	•	Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene 1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
		n-Propylbenzene	<1.0	1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chloratoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene tert-Butylbenzene	<1.0 <1.0	1.0 1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
	-	sec-Butylbenzene	<1.0	1.0	
	•	1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene p-Isopropyltoluene	<1.0 <1.0	1.0 1.0	
		1,2-Dichlorobenzene	<1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene Naphthalene	<1.0 <1.0	1.0 1.0	
-		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone Dichlorodifluoromethane	<10 <1.0	10 1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0	1.0	
•		Chloroethane Trichlorofluoromethane	<1.0 <1.0	1.0 1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	•
		Methyl Isobutyl Ketone 2-Hexanone	<10	10	
		Acrolein	<10 <10	10 10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	. <1.0	1.0	
		lodomethane	<1.0	1.0	
	Surrogate Recoveries				
	-	1,2-Dichloroethane-d4	85		% Recovery
		Toluene-d8	109		
		4-Bromofluorobenzene	107		•

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
							· 1

### **QUALITY ASSURANCE DATA**

### VOLATILE ORGANIC COMPOUNDS QUALITY ASSURANCE REPORT FORM

SAMPLE LOT	96-23551	
SAMPLE MATRIX	Water	
EXTRACTION DATE	na ·	
ANALYST	RH	

### MATRIX SPIKE / MATRIX SPIKE DUPLICATE DATA

Compound	Spike Added (µg)/L	Sample (µg)	Matrix Spike (µg)	Matrix Spike % Rec	Matrix Spike Duplicate (µg)	Matrix Spike Duplicate % Rec	% Difference ( <u>Difference</u> ) Average	QC Limits
1,1-Dichloroethene	5.0	<1.0	5.2	104	5.0	100	3.9	60-140%
Benzene	5.0	<1.0	5.2	104	5.2	104	0	60-140%
Trichloroethene	5.0	2.5	7.8	106	7.7	104	1.9	60-140%
Toluene	5.0	<1.0	5.5	110	5.3	106	3.7	60-140%
Chlorobenzene	5.0	<1.0	5.7	114	5.6	112	1.8	60-140%



**ENERGY LABORATORIES, INC.**P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
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James Machin Radian Corporation P.O. Box 201088 Austin, TX 78720-1088

Ellsworth AFB, BG-04

June 5, 1996 96-23588-90

Sampled: 05-23/24-96

Submitted: 05-24-96

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed	

### Water Analysis

Effluent #9 96-23588 8260 LONG RH:06-03-96

	<u>μ</u> g/L	<u>PQL</u>
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	<1.0	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	<1.0	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	<1.0	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	2.2	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	<1.0	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	< 1.0	1.0
1,2-Dibromoethane	<1.0	
		1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	<1.0	1.0
M+P Xylenes	<1.0	1.0
O-Xylene	<1.0	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	<1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	< 1.0	1.0
n-Propylbenzene	<1.0	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	<1.0	1.0
tert-Butylbenzene	< 1.0	1.0
1,2,4-Trimethylbenzene	<1.0	1.0
sec-Butylbenzene	<1.0	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	<1.0	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	<1.0	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	< 1.0	1.0
Naphthalene	<1.0	1.0
Hexachlorobutadiene	<1.0	1.0

Page 2 of 6

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
ffluent #9	ont.	96-23588	8260 LONG				RH:06-03-
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					<i>μ</i> g/L	POL	
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	<20	20	
				Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
4				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	< 1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
	•			2-Hexanone	<10	10	
				Acrolein	·<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				lodomethane	<1.0	1.0	
		:	Surrogate Recoveries				
				1,2-Dichloroethane-d4	103	%	Recovery
				Toluene-d8	101		
				4-Bromofluorobenzene	98		

Site Dept	h Lab No.	Methodology	Analysis	Results	Units	Analyzed
fl #4.0	00 00500					
fluent #10	96-23589	8260 LONG		unil	BOI	RH:06-03
			1,1-Dichloroethene	<u>μα/L</u> <1.0	<u>PQL</u> 1.0	
			Methylene Chloride	<1.0	1.0	
			trans-1,2-Dichloroethene	<1.0	1.0	
			1,1-Dichloroethane 2,2-Dichloropropane	<1.0	1.0	
			cis-1,2-Dichloroethene	<1.0 <1.0	1.0 1.0	
			Bromochloromethane	<1.0	1.0	
			Chloroform	. <1.0	1.0	•
			1,1,1-Trichloroethane Carbon Tetrachloride	<1.0 <1.0	1.0 1.0	
			1,1-Dichloropropene	<1.0	1.0	
			Benzene	<1.0	1.0	
			1,2-Dichloroethane Trichloroethene	<1.0	1.0	
			1,2-Dichloropropane	2.0 <1.0	1.0 1.0	
			Dibromomethane	<1.0	1.0	
			Bromodichloromethane	<1.0	1.0	
			Trans-1,3-Dichloropropene Toluene	<1.0	1.0	
			cis-1,3-Dichloropropene	<1.0 <1.0	1.0 1.0	
			1,1,2-Trichloroethane	<1.0	1.0	
			Tetrachloroethene	<1.0	1.0	
			1,3-Dichloropropane Dibromochloromethane	<1.0 <1.0	1.0 1.0	
	k-		1,2-Dibromoethane	<1.0	1.0	
			Chlorobenzene	<1.0	1.0	
			1,1,1,2-Tetrachloroethane Ethylbenzene	<1.0 <1.0	1.0	•
			M+P Xylenes	<1.0	1.0 1.0	
			O-Xylene	<1.0	1.0	
			Styrene	<1.0	1.0	
			Bromoform Isopropylbenzene	<1.0 <1.0	1.0 1.0	
			Bromobenzene	<1.0	1.0	
			1,1,2,2-Tetrachloroethane	<1.0	1.0	
			1,2,3-Trichloropropane n-Propylbenzene	<1.0 <1.0	1.0 1.0	
			2-Chiorotoluene	<1.0	1.0	
	•		4-Chlorotoluene	<1.0	1.0	
			1,3,5-Trimethylbenzene tert-Butylbenzene	<1.0 <1.0	1.0 1.0	
			1,2,4-Trimethylbenzene	<1.0	, 1.0	
			sec-Butylbenzene 1,3-Dichlorobenzene	< 1.0	1.0	
			1,4-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
			p-Isopropyttoluene	<1.0	1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
			n-Butylbenzene 1,2-Dibromo-3-Chloropropane	<1.0 <1.0	1.0 1.0	
			1,2,4-Trichlorobenzene	<1.0	1.0	
			Naphthalene	<1.0	1.0	
			Hexachlorobutadiene 1,2,3-Trichlorobenzene	<1.0 <1.0	1.0 1.0	
			Acetone	<20	20	
			Methyl Ethyl Ketone	<10	10	
			Dichlorodifluoromethane Chloromethane	<1.0 <1.0	1.0 1.0	
			Vinyl Chloride	<1.0	1.0	
			Bromomethane	<1.0	1.0	
			Chloroethane Trichlorofluoromethane	<1.0 <1.0	1.0 1.0	
			2-Chloroethylvinylether	<1.0	1.0	
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate Methyl Isobutyl Ketone	<1.0 <10	1.0 10	
•			2-Hexanone	<10	10	
			Acrolein	<10	10	
			Acrylonitrile Methyltertiary Butyl Ether	<10 <1.0	10	
			lodomethane	<1.0	1.0 1.0	
		Companie Berner				
		Surrogate Recoveries				_
			1,2-Dichloroethane-d4	102	%	Recovery

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
ffluent #11		96-23590	8260 LONG	4 4 Diablescontes	<u>μg/L</u>	POL	RH:06-03-
				1,1-Dichloroethene Methylene Chloride	<1.0 <1.0	1.0 1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0	1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane Chloroform	<1.0	1.0	
				1,1,1-Trichloroethane	<1.0 <1.0	1.0 1.0	
				Carbon Tetrachloride	<1.0	1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
				Trichloroethene	2.2	1.0	
				1,2-Dichloropropane Dibromomethane	<1.0 <1.0	1.0 1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene	<1.0	1.0	
				cis-1,3-Dichloropropene	<1.0	1.0	
				1,1,2-Trichloroethane	<1.0	1.0	
				Tetrachloroethene 1,3-Dichloropropane	<1.0 <1.0	1.0 1.0	
				Dibromochloromethane	<1.0	1.0	
				1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene	<1.0	1.0	
		•		1,1,1,2-Tetrachloroethane	<1.0	1.0	
				Ethylbenzene	<1.0	1.0	
				M + P Xylenes O-Xylene	<1.0 <1.0	1.0 1.0	
				Styrene	<1.0	1.0	
			•	Bromoform	<1.0	1.0	
				Isopropylbenzene	<1.0	1.0	
				Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
				n-Propylbenzene	<1.0	1.0	
				2-Chlorotoluene	<1.0	1.0	
				4-Chlorotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,2,4-Trimethylbenzene sec-Butylbenzene	<1.0	1.0	
			•	1,3-Dichlorobenzene	<1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
				p-isopropyltoluene	<1.0	1.0	
			. *	1,2-Dichlorobenzene	<1.0	1.0	
				n-Butylbenzene 1,2-Dibromo-3-Chloropropan	<1.0 ne <1.0	1.0 1.0	
				1,2,4-Trichlorobenzene	<1.0	1.0	
				Naphthalene	< 1.0	1.0	
				Hexachlorobutadiene	<1.0	1.0	
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	<20	20	•
				Methyl Ethyl Ketone Dichlorodifluoromethane	<10 <1.0	10 1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10		,
				2-Hexanone	<10	10	
			•	Acrolein	<10	10	
				Acrylonitrile Methyltertiary Butyl Ether	<10 <1.0	10 1.0	
		â	Surranata Pacavarias	lodomethane	<1.0	1.0	
		. 1	Surrogate Recoveries	1,2-Dichloroethane-d4	104	%	Recovery
		1/	10	Toluene-d8	102	,-	•
		11 12	11/	4-Bromofluorobenzene	97		

C-20

Laboratory Manager

### **QUALITY ASSURANCE DATA**

Method Blank	8260 LONG			201	RH:06-03-96
		1 1 Dioblososthone	<u>µg/L</u>	POL	
		1,1-Dichloroethene Methylene Chloride	<1.0 <1.0	1.0 1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichforoethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
•		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene 1,2-Dichloroethane	<1.0 <1.0	1.0 1.0	
		Trichloroethene	<1.0	1.0	
	•	1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene 1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0 <1.0	1.0 1.0	
		1,2-Dibromoethane	<1.0	1.0	
		Chlorobenzene	<1.0	1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M + P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1.0	
•		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene 1,1,2,2-Tetrachioroethane	<1.0 <1.0	1.0 1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
	•	n-Propylbenzene	<1.0	1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	< 1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene 1,3-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene	<1.0	1.0	••
		1,2-Dichlorobenzene	<1.0	1.0	
·		n-Butylbenzene	< 1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
•		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0 20	
•		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
		Chloromethane	< 1.0	1.0	
	-	Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether Carbon Disulfide	<1.0 <1.0	1.0 1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
		Acrolein	<10	10	
		Acrylonitrile	< 10	10	
		Methyltertiary Butyl Ether	< 1.0	1.0	
		lodomethane	<1.0	. 1.0	
	Surrogate Recoveries	4.0 Dishlamost 44	••	a	
		1,2-Dichloroethane-d4	98 104	% Re	covery
		Toluene-d8 4-Bromofluorobenzene	104 98		
•	•	-7-DI OMONOO ODENZENE	30		

### **QUALITY ASSURANCE DATA**

Trip Blank	8260 LONG				RH:06-03-96
			<u>μg/L</u>	POL	
		1,1-Dichloroethene Methylene Chloride	<1.0 <1.0	1.0 1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0 <1.0	1.0 1.0	
		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene	<1.0	1.0	
•		1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0	1.0	
		1,2-Dichloropropane Dibromomethane	<1.0 <1.0	1.0 1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
* · · · · · · · · · · · · · · · · · · ·		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane Dibromochloromethane	<1.0 <1.0	1.0 1.0	
		1,2-Dibromoethane	<1.0	1.0	
		Chiorobenzene	< 1.0	1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M + P Xylenes O-Xylene	<1.0 <1.0	1.0 1.0	
		Styrene	<1.0	1.0	
•		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	< 1.0	1.0	
•		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane n-Propylbenzene	<1.0 <1.0	1.0 1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chlorotoluene	< 1.0	1.0	
		1,3,5-Trimethylbenzene	< 1.0	1.0	
		tert-Butylbenzene	< 1.0	1.0	
		1,2,4-Trimethylbenzene sec-Butylbenzene	<1.0 <1.0	1.0 1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	< 1.0	1.0	
		p-Isopropyitoluene	< 1.0	1.0	
		1,2-Dichlorobenzene	< 1.0	1.0	
		n-Butylbenzene 1,2-Dibromo-3-Chloropropane	<1.0 <1.0	1.0 1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	< 1.0	1.0	
		1,2,3-Trichiorobenzene	<1.0	1.0	
		Acetone	< 20	20	
		Methyl Ethyl Ketone Dichlorodifluoromethane	<10 <1.0	10 1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride -	<1.0	1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	< 10	10	
		2-Hexanone	<10	10	
		Acrolein Acrylonitrile	<10 <10	10 10	
		Methyltertiary Butyl Ether	<1.0	1.0	
		lodomethane	<1.0	1.0	
	•			•	
•	Surrogate Recoveries				
•		1,2-Dichloroethane-d4	102	% Rec	overy
	•	Toluene-d8 4-Bromofluorobenzene	100 97		
,		· Signondorousikeria	31	100	



### **ENERGY LABORATORIES, INC.**

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James Machin Radian Corporation P.O. Box 201088 Austin, TX 78720-1088

Ellsworth AFB BG-04, EW-2 Sampled: 05-24/25-96 June 5, 1996 96-23601-03 Submitted: 05-28-96

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
L							

### Water Analysis

BG-04 Effluent #12

96-23601 8260 LONG

RH:06-03-96

	<u>μg/L</u>	POL
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	<1.0	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	< 1.0	1.0
Bromochloromethane	< 1.0	1.0
Chioroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	<1.0	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	2,1	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	< 1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	<1.0	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
	<1.0	1.0
Ethylbenzene M + P Xylenes	<1.0	1.0
•		
O-Xylene	<1.0	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	<1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	< 1.0	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	<1.0	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	<1.0	1.0
sec-Butylbenzene	<1.0	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	<1.0	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	< 1.0	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	< 1.0	1.0
Naphthalene	<1.0	1.0
Hexachlorobutadiene	<1.0	1.0

Page 2 of 7

Site Depth		Lab No.	Methodology Analysi	Analysis	Results	Units	Analyzed
G-04 Efflu	ent #12	96-23601	8260 LONG	•			RH:06-03-
					ua/I	PO1	NH:00-03-
				1,2,3-Trichlorobenzene	<u>μg/L</u> <1.0	<u>PQL</u> 1.0	
				Acetone			
					<20	. 20	
	*			Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
			•	Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	< 1.0	1.0	
		•		lodomethane	<1.0	1.0	
		5	Surrogate Recoveries				
			-	1,2-Dichloroethane-d4	102	%	Recovery
	*			Toluene-d8	99		,
				4-Bromofluorobenzene	95		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
G-04 Effluer	nt #13	96-23602	8260 LONG				
		70 20002	orgo roug		<u>μg/L</u>	PQL	RH:06-03-
				1,1-Dichloroethene	<1.0	1.0	
				Methylene Chloride	<1.0	1.0	
				trans-1,2-Dichloroethene 1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0 <1.0	1.0 1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane	<1.0	1.0	
				Chloroform 1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride	<1.0 <1.0	1.0 1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
				.Trichloroethene 1,2-Dichloropropane	2.2 <1.0	1.0	
				Dibromomethane	<1.0	1.0 1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene cis-1,3-Dichloropropene	<1.0	1.0	
				1,1,2-Trichloroethane	<1.0 <1.0	1.0 1.0	
				Tetrachloroethene	< 1.0	1.0	
				1,3-Dichloropropane	< 1.0	1.0	
				Dibromochloromethane	<1.0	1.0	
				1,2-Dibromoethane Chlorobenzene	<1.0 <1.0	1.0 1.0	
				1,1,1,2-Tetrachloroethane	<1.0	1.0	
				Ethylbenzene	<1.0	1.0	
				M+P Xylenes	<1.0	1.0	
				O-Xylene Styrene	<1.0 <1.0	1.0	
				Bromoform	<1.0	1.0 1.0	
		•		Isopropylbenzene	<1.0	1.0	
				Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
				n-Propylbenzene	<1.0	1.0	
				2-Chlorotoluene	<1.0	1.0	
				4-Chlorotoluene 1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,2,4-Trimethylbenzene	<1.0	1.0	
				sec-Butylbenzene	<1.0	1.0	
				1,3-Dichlorobenzene 1,4-Dichlorobenzene	<1.0	1.0	
				p-Isopropyltoluene	<1.0 <1.0	1.0 1.0	
				1,2-Dichlorobenzene	<1.0	1.0	
				n-Butylbenzene	<1.0	1.0	
				1,2-Dibromo-3-Chloropropane 1,2,4-Trichlorobenzene		1.0	
				Naphthalene	<1.0 <1.0	1.0 1.0	
				Hexachlorobutadiene	<1.0	1.0	
-				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone Methyl Ethyl Ketone	<20	20	
				Dichlorodifluoromethane	<10 <1.0	10 1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane Chloroethane	<1.0 <1.0	1.0	÷
				Trichlorofluoromethane	<1.0	1.0 1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate Methyl Isobutyl Ketone	<1.0 <10	1.0	
				2-Hexanone	<10	10 10	
				Acrolein	<10	10	
	•			Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether lodomethane	<1.0	1.0	
		•		iodometrane	<1.0	1.0	
		S	urrogate Recoveries			•	
				1,2-Dichloroethane-d4	103	% R	ecovery
				Toluene-d8	. 98		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
M O De et Terr		00 00000	000010N0		#	<b>D</b> 0.	
W-2 Post Tes	τ	96-23603	8260 LONG	1,1-Dichloroethene	<u>μg/L</u> <1.0	POL	RH:06-03
				Methylene Chloride	<1.0	1.0 1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0	1.0	
		•		cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
				1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride	<1.0	1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
				Trichloroethene 1,2-Dichloropropane	36 <1.0	(1) 1.0 1.0	
				Dibromomethane	<1.0	1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene	<1.0	1.0	
				cis-1,3-Dichloropropene 1,1,2-Trichloroethane	<1.0	1.0	
				Tetrachloroethane	<1.0 <1.0	1.0 1.0	
				1,3-Dichloropropane	<1.0	1.0	
				Dibromochloromethane	<1.0	1.0	•
				1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene	<1.0	1.0	
				1,1,1,2-Tetrachioroethane Ethylbenzene	<1.0 <1.0	1.0 1.0	
				M+P Xylenes	<1.0	1.0	
				O-Xylene	<1.0	1.0	
•				Styrene	<1.0	1.0	
				Bromoform	<1.0	1.0	
				Isopropylbenzene	<1.0	1.0	
				Bromobenzene 1,1,2,2-Tetrachloroethane	<1.0 <1.0	1.0 1.0	
				1,2,3-Trichloropropane	<1.0	1.0	
				n-Propylbenzene	<1.0	1.0	
				2-Chlorotoluene	<1.0	1.0	
				4-Chlorotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene tert-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,2,4-Trimethylbenzene	<1.0	1.0	
				sec-Butylbenzene	<1.0	1.0	**
				1,3-Dichlorobenzene	<1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
				p-isopropyitoluene	<1.0	1.0	
				1,2-Dichlorobenzene n-Butylbenzene	<1.0 <1.0	1.0 1.0	
				1,2-Dibromo-3-Chloropropane		1.0	
				1,2,4-Trichlorobenzene	<1.0	1:0	
				Naphthalene	<1.0	1.0	•
				Hexachlorobutadiene	<1.0	1.0	
		•		1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0 20	
				Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0 <1.0	1.0 1.0	
				Chloroethane Trichlorofluoromethane	<1.0	1.0	
		-		2-Chloroethylvinylether	<1.0	1.0	
			•	Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone Acrolein	<10 <10	10 10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
			_	lodomethane	<1.0	1.0	
		:	Surrogate Recoveries	4.9 Diableseash and 44	400		9/ Paggiers
				1,2-Dichloroethane-d4 Toluene-d8	100 105		% Recovery
					103		

(1)-Value derived from a 10x dilution.

Kurt R. Slentz Yout Calleur Laboratory Manager

### **QUALITY ASSURANCE DATA**

			•		
Method Blank	8260 LONG				
Wictioa Blank	0200 LONG	•		001	RH:06-03-96
		1,1-Dichloroethene	<u>μg/L</u> <1.0	<u>PQL</u> 1.0	
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
	•	cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
•		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		. Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0 <1.0	1.0	
		Benzene 1,2-Dichloroethane	<1.0	1.0 1.0	
		Trichloroethene	<1.0	1.0	
		1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	< 1:0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane 1,2-Dibromoethane	<1.0	1.0 1.0	
		Chlorobenzene	<1.0 <1.0	1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M+P Xylenes	<1.0	1.0	
		0-Xylene	<1.0	1.0	
		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane n-Propylbenzene	<1.0 <1.0	1.0 1.0	
	•	2-Chlorotoluene	<1.0	1.0	
		4-Chlorotaluene	<1.0	1.0	
•		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
•		1,2,4-Trimethylbenzene	< 1.0	1.0	
		sec-Butylbenzene ,	<1.0	1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene n-Butylbenzene	<1.0 <1.0	1.0 1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlarobenzene	<1.0	1.0	
		Acetone	<20	20	
-		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride	<1.0	1.0	
•		Bromomethane Chloroethane	<1.0 <1.0	1.0 1.0	
		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyf Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
		Acrolein	< 10	10	
		Acrylonitrile	< 10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
	Community Deservation	lodomethane	<1.0	1.0	
	Surrogate Recoveries	1,2-Dichloroethane-d4	98	% Rec	overv
		Toluene-d8	104	76 HeC	UVEIY
		4-Bromofluorobenzene	98		
		C 27			

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### QUALITY ASSURANCE DATA

Trip Blank	8260 LONG				RH:06-03-96
			<u>μα/L</u>	PQL	
		1,1-Dichloroethene	<1.0	1.0	
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene 1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0 <1.0	1.0 1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
	•	Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene Benzene	<1.0 <1.0	1.0 1.0	
•		1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0	1.0	
		1,2-Dichloropropane	<1.0	1.0	
	•	Dibromomethane	< 1.0	1.0	•
		Bromodichloromethane	<1.0	1.0	
	•	Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene cis-1,3-Dichloropropene	<1.0 <1,0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0	1.0	
		1,2-Dibromoethane	<1.0	1.0	
	•	Chlorobenzene	<1.0 <1.0	1.0	
		1,1,1,2-Tetrachloroethane Ethylbenzene	<1.0	1.0 1.0	
		M + P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1.0	
		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
•		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0 <1.0	1.0 1.0	
		1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene	<1.0	1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	•
	•	tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene sec-Butylbenzene	<1.0 <1.0	1.0 1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene	<1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane 1,2,4-Trichlorobenzene	<1.0 <1.0	1.0 1.0	
	•	Nachthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane Chloromethane	<1.0 <1.0	1.0 1.0	•
		Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	< 1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate Methyl Isobutyl Ketone	<1.0 <10	1.0 10	
		2-Hexanone	<10	10	
		Acrolein	<10	10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
		lodomethane	<1.0	1.0	
	Surrogate Recoveries	1.2 Diablerosthans d4	. 105		% Recovery
		1,2-Dichloroethane-d4 Toluene-d8	105 106		o necovery
		4-Bromofluorobenzene	100		

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### QUALITY ASSURANCE DATA

### VOLATILE ORGANIC COMPOUNDS QUALITY ASSURANCE REPORT FORM

SAMPLE LOT	96-23602	
SAMPLE MATRIX	Water	
EXTRACTION DATE	na	
ANALYST	RH	

### MATRIX SPIKE / MATRIX SPIKE DUPLICATE DATA

Compound	Spike Added (µg)/L	Sample (µg)	, Matrix Spike (µg)	Matrix Spike % Rec	Matrix Spike Duplicate (µg)	Matrix Spike Duplicate % Rec	% Difference (Difference) Average	QC Limits
1,1-Dichloroethene	. 5.0	<1.0	5.0	- 100	5.4	108	7.7	60-140%
Benzene	5.0	<1.0	5.1	102	5.7	114	11.1	60-140%
Trichloroethene	5.0	2.2	7.5	106	7.7	110	3.7	60-140%
Toluene	5.0	<1.0	5.5	110	5.8	116	5.3	60-140%
Chlorobenzene	5.0	< 1.0	5.8	116	6.2	124	6.7	60-140%

Site Dep	th Lab No.	Methodology	Analysis	Results	Units	Analyzed
W-1B Post Test	96-23375	8260 LONG				RH:05-20-
				<u>μ</u> g/L	POL	
			1,1,1,2-Tetrachloroethane	<1.0	1.0	
			Ethylbenzene	<1.0	1.0 1.0	
			M + P Xylenes O-Xylene	<1.0 <1.0	1.0	
			Styrene	<1.0	1.0	
			Bromoform	<1.0	1.0	
			Isopropylbenzene	<1.0	1.0	
			Bromobenzene	<1.0	1.0	
			1,1,2,2-Tetrachloroethane	<1.0	1.0	
			1,2,3-Trichloropropane	<1.0 <1.0	1.0 1.0	
		•	n-Propylbenzene 2-Chlorotoluene	<1.0	1.0	
•			4-Chlorotoluene	<1.0	1.0	
			1,3,5-Trimethylbenzene	<1.0	1.0	
			tert-Butylbenzene	<1.0	1.0	
			1,2,4-Trimethylbenzene	<1.0	1.0	
			sec-Butylbenzene	<1.0	1.0	
			1,3-Dichlorobenzene	<1.0	1.0	
			1,4-Dichlorobenzene p-Isopropyltoluene	<1.0 <1.0	1.0 1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
			n-Butylbenzene	<1.0	1.0	
			1,2-Dibromo-3-Chloropropan	e <1.0	1.0	
			1,2,4-Trichlorobenzene	<1.0	1.0	
			Naphthalene	<1.0	1.0	
			Hexachlorobutadiene	<1.0	1.0	
			1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0	
			Methyl Ethyl Ketone	25	10	
			Dichlorodifluoromethane	<1.0	1.0	
			Chloromethane	<1.0	1.0	
			Vinyl Chloride	<1.0	1.0	
			Bromomethane	<1.0	1.0	
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate	<1.0	1.0	
			Methyl Isobutyl Ketone	<10	10	
			2-Hexanone	<10	10	
			Acrolein	<10	10	
•			Acrylonitrile	<10	10	
			Methyltertiary Butyl Ether lodomethane	<1.0 <1.0	1.0 1.0	
			i .	~1.0	1.0	
		Surrogate Recoveries				
			1,2-Dichloroethane-d4	101	. 9	% Recovery
			Toluene-d8	100		
			4-Bromofluorobenzene	105		
	(1)-Value derived fro	m a 50x dilution.				
. •			•			
W-2 Pre Test	96-23376	8260 LONG				RH:05-17
W-Z Fie Test	0-23370	0200 LONG		<i>µ</i> g/L	PQL	4
	_		1,1-Dichloroethene	< 2.0	2.0	•
			Methylene Chloride	< 2.0	2.0	
			trans-1,2-Dichloroethene	<2.0	2.0	
			1,1-Dichloroethane	< 2.0	2.0	
			2,2-Dichloropropane	<2.0	2.0	
			cis-1,2-Dichloroethene Bromochloromethane	<2.0 <2.0	2.0 2.0	
		•	Chloroform	<2.0	2.0	
			1,1,1-Trichloroethane	<2.0	2.0	
•			Carbon Tetrachloride	<2.0	2.0	
			1,1-Dichloropropene	< 2.0	2.0	
		-	Benzene	<2.0	2.0	
			1,2-Dichloroethane	< 2.0	2.0	

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Site D	epth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
W-2 Pre Test		96-23376	8260 LONG		_		RH:05-17-
				Trichloroethene	<u>μg/L</u> 45 (1)	<u>PQL</u> 2.0	
				1,2-Dichloropropane	<2.0	2.0	
				Dibromomethane	<2.0	2.0	
				Bromodichloromethane	<2.0	2.0	
				Trans-1,3-Dichloropropene	<2.0	2.0	
				Toluene	<2.0	2.0	
				cis-1,3-Dichloropropene	<2.0	2.0	
				1,1,2-Trichloroethane	<2.0 <2.0	2.0 2.0	
				Tetrachloroethene 1,3-Dichloropropane	<2.0	2.0	
				Dibromochloromethane	<2.0	2.0	
	•			1,2-Dibromoethane	<2.0	2.0	
				Chlorobenzene	<2.0	2.0	
				1,1,1,2-Tetrachloroethane	<2.0	2.0	
				Ethylbenzene	<2.0	2.0	
				M + P Xylenes	<2.0	2.0	
				O-Xylene	<2.0	2.0	
				Styrene Bromoform	<2.0 <2.0	2.0 2.0	
				Isopropylbenzene	<2.0	2.0	
				Bromobenzene	<2.0	2.0	
				1,1,2,2-Tetrachloroethane	< 2.0	2.0	
				1,2,3-Trichloropropane	<2.0	2.0	
				n-Propylbenzene	<2.0	2.0	
				2-Chlorotoluene	<2.0	2.0	
				4-Chlorotoluene	<2.0	2.0	
				1,3,5-Trimethylbenzene	<2.0 <2.0	2.0 2.0	
				tert-Butylbenzene 1,2,4-Trimethylbenzene	<2.0 <2.0	2.0	
				sec-Butylbenzene	<2.0	2.0	
				1,3-Dichlorobenzene	<2.0	2.0	
				1,4-Dichlorobenzene	<2.0	2.0	
				p-IsopropyItoluene	<2.0	2.0	
				1,2-Dichlorobenzene	<2.0	2.0	
				n-Butylbenzene	<2.0	2.0	
				1,2-Dibromo-3-Chloropropar 1,2,4-Trichlorobenzene	ne <2.0 <2.0	2.0 2.0	
			1	Naphthalene	<2.0	2.0	
				Hexachlorobutadiene	<2.0	2.0	
				1,2,3-Trichlorobenzene	<2.0	2.0	
				Acetone	< 40	20	
				Methyl Ethyl Ketone	<20	20	
				Dichlorodifluoromethane	<2.0	2.0	
				Chloromethane Vinyl Chloride	<2.0 <2.0	2.0 2.0	
				Vinyi Chionde Bromomethane	<2.0	2.0	
•				Chloroethane	<2.0	2.0	
				Trichlorofluoromethane	<2.0	2.0	
				2-Chloroethylvinylether	< 2.0	2.0	
				Carbon Disulfide	<2.0	2.0	
				Vinyl Acetate	<2.0	2.0	
				Methyl Isobutyl Ketone	<20	20 20	
				2-Hexanone Acrolein	<20 <20	20	
				Acrylonitrile	<20	20	
				Methyltertiary Butyl Ether	<2.0	2.0	
				lodomethane	<2.0	2.0	•
			Surrogate Recoveries	1,2-Dichloroethane-d4	111	0,	6 Recovery
				Toluene-d8	114	7	. 1000 FOI y
				4-Bromofluorobenzene	107		
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Kurt R. Slentz\_

Laboratory Manager

### QUALITY ASSURANCE DATA

Method Blank	8260 LONG		μg/L	PQL	RH:05-17-96
·	0200 2011	1,1-Dichloroethene	<1.0	1.0	nn.05-17-50
·		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0 <1.0	1.0	
		cis-1,2-Dichloroethene Bromochloromethane	<1.0	1.0 1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		· Benzene 1,2-Dichloroethane	<1.0 <1.0	1.0 1.0	
		Trichloroethene	<1.0	1.0	
	•	1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
•		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene cis-1,3-Dichloropropene	<1.0 <1.0	1.0 1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
•		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0	1.0	
		1,2-Dibromoethane Chlorobenzene	<1.0 <1.0	1.0 1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M + P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1.0	
	•	Styrene Bromoform	<1.0 <1.0	1.0 1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	•
		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene sec-Butylbenzene	<1.0 <1.0	1.0 1.0	
se*		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene	<1.0	1.0	
•		n-Butylbenzene 1,2-Dibromo-3-Chloropropane	<1.0 <1.0	1.0 1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
	•	Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0 20	
		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride	<1.0	1.0	
		Bromomethane Chloroethane	<1.0 <1.0	1.0 1.0	
	•	Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
1		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone 2-Hexanone	<10 <10	10 10	
		Acrolein	<10	10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
	0 5	lodomethane	<1.0	1.0	
	Surrogate Recoveries	1,2-Dichloroethane-d4	111	% Reco	verv
		Tokuene-d8	113	% nece	, <del>, , , , , , , , , , , , , , , , , , </del>
		4-Bromofluorobenzene	106		
		C-32			
		<b>U</b> -J <u>L</u>			

Site Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
		(	QUALITY ASSURANCE DATA			
lethod Blank		8260 LONG		μg/L	PQL	RH:05-20-96
ictrica Blank		0200 20114	1,1-Dichloroethene	<1.0	1.0	1111.03-20-31
			Methylene Chloride	<1.0	1.0	
			trans-1,2-Dichloroethene 1,1-Dichloroethane	<1.0 <1.0	1.0 1.0	
			2,2-Dichloropropane	<1.0	1.0	
			cis-1,2-Dichloroethene	<1.0	1.0	
			Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
			1,1,1-Trichloroethane	<1.0	1.0	
			Carbon Tetrachloride	<1.0	1.0	
			1,1-Dichloropropene	<1.0	1.0	
			Benzene 1,2-Dichloroethane	<1.0 <1.0	1.0 1.0	
•			Trichloroethene	<1.0	1.0	
			1,2-Dichloropropane	<1.0	1.0	
			Dibromomethane Bromodichloromethane	<1.0 <1.0	1.0 1.0	
			Trans-1,3-Dichloropropene	<1.0	1.0	
			Toluene	<1.0	1.0	
			cis-1,3-Dichloropropene 1,1,2-Trichloroethane	<1.0 <1.0	1.0 1.0	
			Tetrachloroethene	< 1.0	1.0	
			1,3-Dichloropropane	<1.0	1.0	
			Dibromochloromethane 1,2-Dibromoethane	<1.0 <1.0	1.0 1.0	
			Chlorobenzene	<1.0	1.0	
			1,1,1,2-Tetrachloroethane	<1.0	1.0	
			Ethylbenzene M+P Xylenes	<1.0 <1.0	1.0 1.0	
			O-Xylene	<1.0	1.0	
			Styrene	<1.0	1.0	
			Bromoform	<1.0	1.0	
			Isopropylbenzene Bromobenzene	<1.0 <1.0	1.0 1.0	
			1,1,2,2-Tetrachloroethane	<1.0	1.0	
			1,2,3-Trichloropropane	<1.0	1.0	
			n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0 1.0	
			4-Chlorotoluene	<1.0	1.0	
			1,3,5-Trimethylbenzene	<1.0	1.0	
			tert-Butylbenzene 1,2,4-Trimethylbenzene	<1.0 <1.0	1.0 1.0	
			sec-Butylbenzene	<1.0	1.0	
			1,3-Dichlorobenzene	<1.0	1.0	
			1,4-Dichlorobenzene p-Isopropyltoluene	<1.0 <1.0	1.0 1.0	
			1,2-Dichlorobenzene	<1.0	1.0	
			n-Butylbenzene	<1.0	1.0	
			1,2-Dibromo-3-Chloropropar 1,2,4-Trichlorobenzene	ne <1.0 <1.0	1.0 1.0	
			Naphthalene	<1.0	1.0	
			Hexachlorobutadiene	<1.0	1.0	
			1,2,3-Trichlorobenzene Acetone	<1.0 <20	1.0 20	
			Methyl Ethyl Ketone	<10	10	
			Dichlorodifluoromethane	<1.0	1.0	
-			Chloromethane Vinyl Chloride	<1.0 <1.0	1.0 1.0	
			Bromomethane	<1.0	1.0	
			Chloroethane	<1.0	1.0	
			Trichlorofluoromethane 2-Chloroethylvinylether	<1.0 <1.0	1.0 1.0	•
			Carbon Disulfide	<1.0	1.0	
			Vinyl Acetate	<1.0	1.0	
			Methyl Isobutyl Ketone	<10	10 10	
			2-Hexanone Acrolein	<10 <10	10 10	
			Acrylonitrile	<10	10	
			Methyltertiary Butyl Ether	<1.0	1.0	
			lodomethane	<1.0	1.0	

1,2-Dichloroethane-d4 Toluene-d8 4-Bromofluorobenzene

100

100 100 % Recovery

Site	Danth	Lab Na	B. G. selb. and all a more	A ! !-			
Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

### QUALITY ASSURANCE DATA

	doan	IT ASSURANCE DATA			
Trip Blank	8260 LONG		μg/L	PQL	RH:05-21-96
		1,1-Dichloroethene	<1.0	1.0	
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane Chloroform	<1.0 <1.0	1.0 1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tétrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene	<1.0	1.0	
		1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0	1.0	
		1,2-Dichloropropane Dibromomethane	<1.0 <1.0	1.0	
		Bromodichloromethane	<1.0	1.0 1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	,
		1,3-Dichloropropane Dibromochloromethane	<1.0	1.0	
•		1,2-Dibromoethane	<1.0 <1.0	1.0 1.0	
		Chlorobenzene	<1.0	1.0	
_		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M+P Xylenes	<1.0	1.0	
		O-Xylene Styrene	<1.0	1.0	
		Bromoform	<1.0 <1.0	1.0 1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene 2-Chlorotoluene	<1.0 <1.0	1.0	
	. *	4-Chlorotoluene	<1.0	1.0 1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene 1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0 <1.0	1.0 1.0	
	•	p-Isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene	< 1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	*
		Naphthalene Hexachlorobutadiene	<1.0 <1.0	1.0 1.0	
	,	1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	•
		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
	<del>-</del>	Chloromethane Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0 <1.0	1.0 1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	< 1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone 2-Hexanone	<10 <10	10 10	
	•	Acrolein	<10	10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
		lodomethane	<1.0	1.0	
•	Surrogate Recoveries	1 2-Dichleroothers d4	00		
•		1,2-Dichloroethane-d4 Toluene-d8	99 103	% Re	covery
		4-Bromofluorobenzene	101		

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APPENDIX D

Vapor Sample Analytical Data



University of Pittsburgh Applied Research Center 220 William Pitt Way, Pittsburgh, PA 15238 (412) 826-5245 FAX (412) 826-3433

June 3, 1996

Mr. Bill Buchans Radian International 1093 Commerce Park Drive Oak Ridge, TN 37830

Dear Mr. Buchans:

Attached is the final data listing for the samples we received on May 28, 1996, from James Machin, project #612-001-31-30.

Please give me call if you have questions or I can be of further assistance. Thank you for using MICROSEEPS.

Sincerely,

David J. Masdea

DJM/lsp

Attachment:

RAD75-962430



### ANALYSIS OF VOLATILE ORGANICS IN GAS SAMPLES

Gas samples are received and secured in accordance with Microseeps documented sample receipt procedures. Analyses are performed using Microseeps Analytical Method AM4.03. Analytical method AM4.03 is a modification of USEPA Method 3810 (Headspace) and 8000 (Gas Chromatography). Modifications implemented are to accommodate the gas phase sample type only. All applicable quality control procedures are followed including continuing calibration check standards and laboratory blanks. Microseeps Analytical Method AM4.03 will be supplied upon request.

---- RADIAN INTERNATIONAL ----

PAGE 1 OF 3

---- PROJECT LOC: ELLSWORTH AFB ----

---- PROJECT NO: 612-001-31-30 ----

---- 601/602 SCAN -----

---- CONCENTRATIONS IN PPMV -----

	SAMPLE ID	SAMPLE ID	SAMPLE ID	SAMPLE ID	
COMPOUND NAME	BG-04 V-1	BG-04 V-2	BG-04 V-3	BG-04 V-4	LDLs
CHLOROMETHANE	<1	<1	<1		1
VINYL CHLORIDE	<b>≺1</b>	<1	<1	<1	1
BROMOMETHANE/CHLOROETHANE*	<1	<1	<1	<1	1
FLUOROTRICHLOROMETHANE	<.005	<.005	<.005	<.005	0.005
1,1 DICHLOROETHYLENE	<.01	<.01	<.01	<.01	0.01
METHYLENE CHLORIDE	<1	<1	<1	<1	1
TRANS-1,2 DICHLOROETHYLENE	<.1	<.1	<.1	<.1	0.1
1,1 DICHLOROETHANE	<.01	<.01	<.01	<.01	0.01
CHLOROFORM	<.005	<.005	<.005	<.005	0.005
1,1,1 TRICHLOROETHANE	<.005	<.005	<.005	<.005	0.005
CARBON TETRACHLORIDE	<.005	<.005	<.005	<.005	0.005
BENZENE	<.07	<.07	<.07	<.07	0.07
1,2 DICHLOROETHANE	<.01	<.01	<.01	<.01	0.01
TRICHLOROETHYLENE	0.366	0.315	0.221	0.492	0.005
1,2 DICHLOROPROPANE	<.01	<.01	<.01	<.01	0.01
BROMOD I CHLOROMETHANE	<.005	<.005	<.005	<.005	0.005
CIS-1,3 DICHLOROPROPYLENE	<.01	<.01	<_01	<.01	0.01
TOLUENE	<.07	<.07	<.07	<.07	0.07
TRANS-1,3 DICHLOROPROPYLENE	<.01	<.01	<.01	<.01	0.01
1,1,2 TRICHLOROETHANE	<.005	<.005	<.005	<.005	0.005
TETRACHLOROETHYLENE	<.005	<.005	<.005	<.005	0.005
CHLORODIBROMOMETHANE	<.005	<.005	<.005	<.005	0.005
CHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
ETHYL BENZENE	<.07	<.07	<.07	<.07	0.07
BROMOFORM	<.005	<.005	<.005	<.005	0.005
1,1,2,2 TETRACHLOROETHANE	<.005	<.005	<.005	<.005	0.005
1,3 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
1,4 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
1,2 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
ADDITIONAL ANALYSIS				*******	
CIS-1,2 DICHLOROETHYLENE	<.01	<.01	<.01	<.01	0.01
FILE NAME	₩62 379	W62 380	W62 381	W62 382	
DATE SAMPLED	05/19/96	05/19/96	05/20/96	05/20/96	
DATE RECEIVED	05/28/96	05/28/96	05/28/96	05/28/96	
DATE ANALYZED	05/28/96	05/28/96	05/28/96	05/28/96	

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

ITIALS LAB MANAGER INITIALS

29-May-96

---- RADIAN INTERNATIONAL ----

PAGE 2 OF 3

---- PROJECT LOC: ELLSWORTH AFB -----

----- PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN -------- CONCENTRATIONS IN PPMV -----

SAMPLE ID SAMPLE ID SAMPLE ID SAMPLE ID BG-04 V-5 BG-04 V-6 CHLOROMETHANE <1 <1 <1 1 <1 VINYL CHLORIDE <1 <1 <1 <1 1 BROMOMETHANE/CHLOROETHANE\* <1 <1 <1 <1 FLUOROTRICHLOROMETHANE <.005 <.005 <.005 <.005 0.005 1,1 DICHLOROETHYLENE <.01 <.01 <.01 <.01 0.01 METHYLENE CHLORIDE <1 <1 <1 <1 1 TRANS-1,2 DICHLOROETHYLENE <.1 <.1 <.1 <.1 0.1 1,1 DICHLOROETHANE <.01 <.01 <.01 <.01 0.01 CHLOROFORM <.005 <.005 <.005 <.005 0.005 1,1,1 TRICHLOROETHANE <.005 <.005 <.005 <.005 0.005 CARBON TETRACHLORIDE <.005 <.005 <.005 <.005 0.005 BENZENE <.07 <.07 <.07 <.07 0.07 1,2 DICHLOROETHANE <.01 <.01 <.01 <.01 0.01 TRICHLOROETHYLENE 0.267 0.400 0.386 0.306 0.005 1,2 DICHLOROPROPANE <.01 <.01 <.01 <.01 0.01 BROMODICHLOROMETHANE <.005 <.005 <.005 <.005 0.005 CIS-1,3 DICHLOROPROPYLENE <.01 <.01 <.01 <.01 0.01 <.07 <.07 <.07 <.07 0.07 TRANS-1,3 DICHLOROPROPYLENE <.01 <.01 <.01 <.01 0.01 1,1,2 TRICHLOROETHANE <.005 <.005 <.005 <.005 0.005 TETRACHLOROETHYLENE <.005 0.005 <.005 <.005 <.005 CHLOROD I BROMOMETHANE <.005 <.005 <.005 <.005 0.005 CHLOROBENZENE <.07 <.07 <.07 <.07 0.07 ETHYL BENZENE <.07 <.07 <.07 <.07 0.07 BROMOFORM <.005 <.005 <.005 <.005 0.005 1,1,2,2 TETRACHLOROETHANE <.005 <.005 <.005 <.005 0.005 1,3 DICHLOROBENZENE <.07 <.07 <.07 <.07 0.07 1,4 DICHLOROBENZENE <.07 <.07 <.07 <.07 0.07 1,2 DICHLOROBENZENE <.07 <.07 <.07 <.07 ADDITIONAL ANALYSIS ------CIS-1,2 DICHLOROETHYLENE W62 383 W62 384 W62 385 W62 386 DATE SAMPLED 05/21/96 05/21/96 05/22/96 05/22/96 DATE RECEIVED 05/28/96 05/28/96 05/28/96 05/28/96 DATE ANALYZED 05/29/96 05/29/96 05/28/96 05/29/96

ANALYST INITIALS D-4

LAB MANAGER INITIALS

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

---- RADIAN INTERNATIONAL ----

PAGE 3 OF 3

----- PROJECT LOC: ELLSWORTH AFB ----PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN ----

---- CONCENTRATIONS IN PPMV -----

	SAMPLE ID	SAMPLE ID	
COMPOUND NAME	BG-04 V-8	BG-04 V-9	LDLs
CHLOROMETHANE	<1	<1	1
VINYL CHLORIDE	<1	<1	.1
BROMOMETHANE/CHLOROETHANE*	<1	<1	1
FLUOROTRICHLOROMETHANE	<.005	<.005	0.005
1.1 DICHLOROETHYLENE	· <.01	<.01	0.01
METHYLENE CHLORIDE	<1	<1	1
TRANS-1,2 DICHLOROETHYLENE	<.1	<.1	0.1
1,1 DICHLOROETHANE	<.01	<.01	0.01
CHLOROFORM	<.005	<.005	0.005
1,1,1 TRICHLOROETHANE	<.005	<.005	0.005
CARBON TETRACHLORIDE	<.005	<.005	0.005
BENZENE	<.07	<.07	0.07
1,2 DICHLOROETHANE	<.01	<.01	0.01
TRICHLOROETHYLENE	0.205	0.201	0.005
1,2 DICHLOROPROPANE	<.01	<.01	0.01
BROMODICHLOROMETHANE	<.005	<.005	0.005
CIS-1,3 DICHLOROPROPYLENE	<.01	<.01	0.01
TOLUENE	<.07	<.07	0.07
TRANS-1,3 DICHLOROPROPYLENE	<.01	<.01	0.01
1,1,2 TRICHLOROETHANE	<.005	<.005	0.005
TETRACHLOROETHYLENE	<.005	<.005	0.005
CHLORODIBROMOMETHANE	<.005	<.005	0.005
CHLOROBENZENE	<.07	<.07	0.07
ETHYL BENZENE	<.07	<.07	0.07
BROMOFORM	<.005	<.005	0.005
1,1,2,2 TETRACHLOROETHANE	<.005	<.005	0.005
1,3 DICHLOROBENZENE	<.07	<.07	0.07
1,4 DICHLOROBENZENE	<.07	<.07	0.07
1,2 DICHLOROBENZENE	<.07	<.07	0.07
ADDITIONAL ANALYSIS			
CIS-1,2 DICHLOROETHYLENE	<.01	<.01	0.01
FILE NAME	₩62 387	W62 388	
DATE SAMPLED	05/22/96	05/23/96	
DATE RECEIVED	05/28/96	05/28/96	
DATE ANALYZED	05/29/96	05/29/96	

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

29-May-96

\*\*\*\* QUALITY CONTROL \*\*\*\*

---- RADIAN INTERNATIONAL ----

---- PROJECT LOC: ELLSWORTH AFB ----

---- PROJECT NO: 612-001-31-30 ----

---- 601/602 SCAN -----

---- CONCENTRATIONS IN PPMV -----

CONTINUING CALIBRATION CHECK

STANDARDS: "624"(LEVEL 2), "624"(LEVEL 1), "VC-996", "CIS"

REFERENCE: W62A/B376, W62A/B377, W62A378, W62B391

			PERCENT
COMPOUND	KNOWN	RESULT	DIFFERENCE
CHLOROMETHANE	20.8	21.9	5.52
VINYL CHLORIDE	996.0	963.1	3.31
BROMOMETHANE/CHLOROETHANE*	2.7	3.0	12.74
FLUOROTRICHLOROMETHANE	0.765	0.822	7.45
1,1 DICHLOROETHYLENE	1.09	1.21	11.71
METHYLENE CHLORIDE	1.24	1.39	12.36
TRANS-1,2 DICHLOROETHYLENE	1.09	1.22	11.98
1,1 DICHLOROETHANE	1.06	1.17	9.78
CHLOROFORM	0.881	0.959	8.85
1,1,1 TRICHLOROETHANE	0.788	0.855	8.50
CARBON TETRACHLORIDE	0.684	0.728	6.43
BENZENE & 1,2-DCA**	2.41	2.39	0.95
1,2 DICHLOROETHANE	1.06	1.17	9.69
TRICHLOROETHYLENE	0.800	0.876	9.50
1,2 DICHLOROPROPANE	0.93	1.00	7.63
BROMODICHLOROMETHANE	0.642	0.708	10.28
CIS-1,3 DICHLOROPROPYLENE	0.95	1.05	11.18
TOLUENE	1.14	1.13	1.31
TRANS-1,3 DICHLOROPROPYLENE	0.95	1.05	10.55
1,1,2 TRICHLOROETHANE	0.788	0.885	12.31
TETRACHLOROETHYLENE	0.634	0.684	7.89
CHLOROD I BROMOMETHANE	0.505	0.560	10.89
CHLOROBENZENE	0.93	0.94	0.86
ETHYL BENZENE	0.99	0.99	0.10
BROMOFORM	0.416	0.468	12.50
1,1,2,2 TETRACHLOROETHANE	0.626	0.696	11.18
1,3 DICHLOROBENZENE	0.72	0.66	8.25
1,4 DICHLOROBENZENE	0.72	0.64	11.05
1,2 DICHLOROBENZENE	0.72	0.63	12.17
CIS-1,2 DICHLOROETHYLENE	27.20	28.90	6.24

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

<sup>\*\*</sup> COMPOUNDS ELUTE TOGETHER ON FID - VALUE REPRESENTS A COMBINATION OF BOTH.

\*\*\*\* QUALITY CONTROL \*\*\*\*

---- RADIAN INTERNATIONAL ----

---- PROJECT LOC: ELLSWORTH AFB -----

----- PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN ----

---- CONCENTRATIONS IN PPMV -----

LABORATORY BLANK RESULTS

BLANK: N2 IN VIAL REFERENCE: W62A/B375

LOWER DETECTION COMPOUND BLANK LIMIT CHLOROMETHANE ND 1.0 VINYL CHLORIDE ND 1.0 BROMOMETHANE/CHLOROETHANE\* ND 1.0 FLUOROTRICHLOROMETHANE ND 0.005 1,1 DICHLOROETHYLENE ND 0.01 METHYLENE CHLORIDE ND 1.00 TRANS-1,2 DICHLOROETHYLENE ND 0.10 1,1 DICHLOROETHANE ND 0.01 CHLOROFORM ND 0.005 1,1,1 TRICHLOROETHANE ND 0.005 CARBON TETRACHLORIDE ND 0.005 BENZENE ND 0.07 1,2 DICHLOROETHANE ND 0.01 TRICHLOROETHYLENE ND 0.005 1,2 DICHLOROPROPANE ND 0.01 BROMODICHLOROMETHANE ND 0.005 CIS-1,3 DICHLOROPROPYLENE ND 0.01 TOLUENE ND 0.07 TRANS-1,3 DICHLOROPROPYLENE ND 0.01 1,1,2 TRICHLOROETHANE ND 0.005 TETRACHLOROETHYLENE ND 0.005 CHLOROD I BROMOMETHANE ND 0.005 CHLOROBENZENE 0.07 ND ETHYL BENZENE ND 0.07 BROMOFORM ND 0.005 1,1,2,2 TETRACHLOROETHANE ND 0.005 1,3 DICHLOROBENZENE ND 0.07 1,4 DICHLOROBENZENE ND 0.07 1,2 DICHLOROBENZENE 0.07 CIS-1,2 DICHLOROETHYLENE 0.01 ND

ANALYST INITIALS D-7

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD - VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

# MICROSEEPS, Inc.

220 William Pitt Way, Pittsburgh, PA 15238

Phone: (412) 826-5245 Fax: (412) 826-3433

Phone #: 5/2/419-5280 Proj. Number: Proj. Location: Address: Proj. Manager: Company Name: Propert 2010BB AUSTIN TX 78720 JAMES MACHIN/BULL BUCHANS 612 001 31 30 FLYSWORTH RADIAN INTERNATIONAL Fax #: 5/2 AFB 1454 BBOF STOPH DAKOTA

Sampler's signature : BU BULLION

### CHAIN-OF-CUSTODY RECORD

Note: Enter proper letters in Requested Analyses columns below.

**Analysis Options** Note: If analysis D, E, or K is selected, scratch (option) NOT wanted.

F 601 & 602 Compounds	E TO-14 by GC/MS	D Mercury (Soi	* C Permanent Gases	* B Hydrogen & Helium	* A C1-C4
ounds	S (Ambient) or (Source **)	(Soil) or (Air **)	(CH4, CO, CO2, N2, O2)	mn	
Other	I	К	1	н	G
ther Specify below.	C11 - C18	K TPH (C5-C10) or (C4-C12)	BTEX & C5 - C10	BTEX	G Chlorinated HC

An additional 22 ml vial of sample is required when requested in combination with another analysis.

D-8

Available upon request.

-	<u> </u>								<del>,</del>	·				<del></del>					
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ry to return.	Date:	Date : V	23/M/ 96		TA CA			13/ -o4	89-04	\$4-0A	张 + 0.4	B4-04	BG-04	B6-04	BG-04	B1-04	8%-04	Identii	Sau
YELLOW	Time :	Time :	1300 PM		45/AX 27/850			1-9	5-8	V-70	V-7	V-6	V-5	V-4	V-3	V-2	V 1	Identification	Sample
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İ			Car		O'BUX 2010BB AUSTIN TX 787													Requested Analyses	
PINK CORY: Submin		-			6				-									ses	
	Сопрапу:	Company:	Company:		YIN, RADIAN		2,0	C, 5 1,2 DCE	25-1,200	45-1,200	C15-1,200E	45-1,2 DE	95-1,2-DCE	C15-1,2 DE	45-1,200	U5-1,2 OLE	C15 -1,2 DCE	(Other)	
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	Timo :	Time:	Time: 10 30 1911														·	<b>₹</b>	



University of Pittsburgh Applied Research Center 220 William Pitt Way, Pittsburgh, PA 15238 (412) 826-5245 FAX (412) 826-3433

June 3, 1996

Mr. Bill Buchans Radian International 1093 Commerce Park Drive Oak Ridge, TN 37830

Dear Mr. Buchans:

Attached is the final data listing for the samples we received on May 29, 1996, from James Machin, project #612-001-31-30.

Please give me call if you have questions or I can be of further assistance. Thank you for using MICROSEEPS.

Sincerely,

David J. Masdea

DJM/lsp

Attachment:

RAD77-962436



### ANALYSIS OF VOLATILE ORGANICS IN GAS SAMPLES

Gas samples are received and secured in accordance with Microseeps documented sample receipt procedures. Analyses are performed using Microseeps Analytical Method AM4.03. Analytical method AM4.03 is a modification of USEPA Method 3810 (Headspace) and 8000 (Gas Chromatography). Modifications implemented are to accommodate the gas phase sample type only. All applicable quality control procedures are followed including continuing calibration check standards and laboratory blanks. Microseeps Analytical Method AM4.03 will be supplied upon request.

RAD77-962436

---- RADIAN INTERNATIONAL ----

---- PROJECT LOC: ELLSWORTH AFB/BG-04 ----

---- PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN -----

---- CONCENTRATIONS IN PPMV -----

	SAMPLE ID	SAMPLE ID	SAMPLE ID	SAMPLE ID	
COMPOUND NAME	BG-04 V-10	BG-04 V-11	BG-04 V-12	BG-04 V-13	LDLs
CHLOROMETHANE	<1	<1	<1	<1	1
VINYL CHLORIDE	<1	<1	<1	<1	1
BROMOMETHANE/CHLOROETHANE*	<1	<1	<1	<1	1
FLUOROTRICHLOROMETHANE	<.005	<.005	<.005	<.005	0.005
1,1 DICHLOROETHYLENE	<.01	<.01	<.01	<.01	0.01
METHYLENE CHLORIDE	<1	<1	<1	<1	1
TRANS-1,2 DICHLOROETHYLENE	<.1	<.1	<.1	<.1	0.1
1,1 DICHLOROETHANE	<.01	<.01	<.01	<.01	0.01
CHLOROFORM	<.005	<.005	<.005	<.005	0.005
1,1,1 TRICHLOROETHANE	<.005	<.005	<.005	<.005	0.005
CARBON TETRACHLORIDE	<.005	<.005	<.005	<.005	0.005
BENZENE	<.07	<.07	<.07	<.07	0.07
1,2 DICHLOROETHANE	<.01	<.01	<.01	<.01	0.01
TRICHLOROETHYLENE	0.171	0.202	0.257	0.160	0.005
1,2 DICHLOROPROPANE	<.01	<.01	<.01	<.01	0.01
BROMODICHLOROMETHANE	<.005	<.005	<.005	<.005	0.005
CIS-1,3 DICHLOROPROPYLENE	<.01	<.01	<.01	<.01	0.01
TOLUENE	<.07	<.07	<.07	<.07	0.07
TRANS-1,3 DICHLOROPROPYLENE	<.01	<.01	<.01	<.01	0.01
1,1,2 TRICHLOROETHANE	<.005	<.005	<.005	<.005	0.005
TETRACHLOROETHYLENE	<.005	<.005	<.005	<.005	0.005
CHLORODIBROMOMETHANE	<.005	<.005	<.005	<.005	0.005
CHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
ETHYL BENZENE	<.07	<.07	<.07	<.07	0.07
BROMOFORM	<.005	<.005	<.005	<.005	0.005
1,1,2,2 TETRACHLOROETHANE	<.005	<.005	<.005	<.005	0.005
1,3 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
1,4 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
1,2 DICHLOROBENZENE	<.07	<.07	<.07	<.07	0.07
ADDITIONAL ANALYSIS			e e		
CIS-1,2 DICHLOROETHYLENE	<.01	<.01	<.01	<.01	0.01
FILE NAME	W62 424	W62 425	W62 426	W62 427	
DATE SAMPLED	05/23/96	05/24/96	05/24/96	05/25/96	
DATE RECEIVED	05/29/96	05/29/96	05/29/96	05/29/96	
DATE ANALYZED	05/30/96	05/30/96	05/31/96	05/31/96	

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

LAB MANAGER INITIALS

31-May-96

RAD77-962436

\*\*\*\* QUALITY CONTROL \*\*\*\*

---- RADIAN INTERNATIONAL ----

---- PROJECT LOC: ELLSWORTH AFB/BG-04 ----

----- PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN -----

---- CONCENTRATIONS IN PPMV -----

DEDCENT

CONTINUING CALIBRATION CHECK

STANDARDS: "624"(LEVEL 2), "624"(LEVEL 1), "VC-996", "CIS"

REFERENCE: W62A/B421, W62A/B422, W62A423, W62B435

COMPOUND	KNOWN	RESULT	PERCENT DIFFERENCE
CHLOROMETHANE	20.8	22.6	8.43
VINYL CHLORIDE	996.0	985.6	1.04
BROMOMETHANE/CHLOROETHANE*	27.4	28.1	2.62
FLUOROTRICHLOROMETHANE	0.765	0.881	15.16
1,1 DICHLOROETHYLENE	10.85	10.58	2.50
METHYLENE CHLORIDE	12.4	12.6	1.78
TRANS-1,2 DICHLOROETHYLENE	10.9	11.3	4.17
1,1 DICHLOROETHANE	10.63	11.14	4.77
CHLOROFORM	8.811	9.170	4.07
1,1,1 TRICHLOROETHANE	7.884	8.301	5.29
CARBON TETRACHLORIDE	0.684	0,778	13.74
BENZENE & 1,2-DCA**	2.41	2.59	7.26
1,2 DICHLOROETHANE	10.63	11.14	4.80
TRICHLOROETHYLENE	8.006	8.342	4.20
1,2 DICHLOROPROPANE	9.31	9.79	5.17
BROMODICHLOROMETHANE	6.420	6.608	2.93
CIS-1,3 DICHLOROPROPYLENE	9.48	9.99	5.41
TOLUENE	1.14	1.19	3.94
TRANS-1,3 DICHLOROPROPYLENE	9.48	10.05	6.07
1,1,2 TRICHLOROETHANE	7.884	8.262	4.79
TETRACHLOROETHYLENE	0.634	0.717	13.09
CHLORODIBROMOMETHANE	5.050	5.178	2.53
CHLOROBENZENE	0.93	1.00	7.49
ETHYL BENZENE	0.99	1.03	3.84
BROMOFORM	4.162	4.376	5.14
1,1,2,2 TETRACHLOROETHANE	6.267	6.992	11.57
1,3 DICHLOROBENZENE	0.72	0.66	8.11
1,4 DICHLOROBENZENE	0.72	0.65	8.81
1,2 DICHLOROBENZENE	0.72	0.68	5.03
CIS-1,2 DICHLOROETHYLENE	27.20	29.20	7.35

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

31-May-96

LAB MANAGER INITIALS

<sup>\*\*</sup> COMPOUNDS ELUTE TOGETHER ON FID - VALUE REPRESENTS A COMBINATION OF BOTH.

RAD77-962436

\*\*\*\* QUALITY CONTROL \*\*\*\*

---- RADIAN INTERNATIONAL ----

---- PROJECT LOC: ELLSWORTH AFB/BG-04 ----

----- PROJECT NO: 612-001-31-30 -----

---- 601/602 SCAN -----

---- CONCENTRATIONS IN PPMV -----

LABORATORY BLANK RESULTS

BLANK: N2 IN VIAL REFERENCE: W62A/B420

LOWER

		DETECTION
COMPOUND	BLANK	LIMIT
CHLOROMETHANE	ND	1.0
VINYL CHLORIDE	ND	1.0
BROMOMETHANE/CHLOROETHANE*	ND	1.0
FLUOROTRICHLOROMETHANE	ND	0.005
1,1 DICHLOROETHYLENE	ND	0.01
METHYLENE CHLORIDE	ND	1.00
TRANS-1,2 DICHLOROETHYLENE	ND	0.10
1,1 DICHLOROETHANE	ND	0.01
CHLOROFORM	ND	0.005
1,1,1 TRICHLOROETHANE	ND	0.005
CARBON TETRACHLORIDE	ND	0.005
BENZENE	ND	0.07
1,2 DICHLOROETHANE	ND	0.01
TRICHLOROETHYLENE	ND	0.005
1,2 DICHLOROPROPANE	ND	0.01
BROMOD I CHLOROMETHANE	ND	0.005
CIS-1,3 DICHLOROPROPYLENE	ND	0.01
TOLUENE	ND	0.07
TRANS-1,3 DICHLOROPROPYLENE	ND	0.01
1,1,2 TRICHLOROETHANE	- ND	0.005
TETRACHLOROETHYLENE	ND	0.005
CHLORODIBROMOMETHANE	ND	0.005
CHLOROBENZENE	ND	0.07
ETHYL BENZENE	ND	0.07
BROMOFORM	ND	0.005
1,1,2,2 TETRACHLOROETHANE	ND	0.005
1,3 DICHLOROBENZENE	ND	0.07
1,4 DICHLOROBENZENE	ND	0.07
1,2 DICHLOROBENZENE	ND	0.07
CIS-1,2 DICHLOROETHYLENE	ND	0.01

<sup>\*</sup> COMPOUNDS ELUTE TOGETHER ON ECD - VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

ANALYST INITIALS

LAB MANAGER INITIALS

31-May-96

## MICROSEEPS, Inc.

220 William Pitt Way, Pittsburgh, PA 15238

Phone: (412) 826-5245 Fax: (412) 826-3433

RADIAN INT Company Name:

Address: 1.0.80x 102088

BIL BULHANS ELLEWORTH AFB JAMES MACHIN 1 Proj. Manager: Proj. Location:

31 30 Fax #: 612001 Phone #: 512419 5280 Proj. Number:

Sampler's signature: BU

## CHAIN-OF-CUSTODY RECORD

TOWARD LAND

Note: Enter proper letters in Requested Analyses columns below.

Analysis Options

Note: If analysis D, E, or K is selected, scratch (option) NOT wanted.

₹	(A) C1 -C4	G Chlorinated HC
=	B Hydrogen & Helium	H BTEX
U	(C Permanent Gases (CH4, CO, CO2, N2, O2)	J BTEX & C5 - C10
Ω	D Mercury (Soil) or (Air **)	K TPH (C5-C10) or (C4-C12)
Ξ	E TO-14 by GC/MS (Ambient) or (Source **)	
H	F 601 & 602 Compounds	Other Specify below.
ŀ		

An additional 22 ml vial of sample is required when requested in combination with another analysis.

Available upon request.

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	ks													Time : 1/3.20	Time:	Time:	
	Remarks	AM 4.02	AM 4.02	ANN 4:02	AM 4.02							ir.		Date:	Date:	Date:	
	(Other)	Cus-1,20E 1	CIS-1,2DUE H		1							N PROJAN IN	72	Company:	Company:	Company:	bmitter
	Requested Analyses											10: JAMES MACHI	ALISTAN TX HOFZD	Received by the Standing	d by!	:d by :	aboratory PINK COPY : Submitter
	Re	σ	F	F	$ \mathcal{F} $							Invoice	<i>i</i>	Receive	Received by	Received by :	OPY: L
Sample	Identification	BG-04 V-10	11-11	V-12	51-13							'spin'	12 K 10 A	Time : 0/800	Time:	Time :	YELLOW COPY : Laboratory
Sar	Identii		BG-04 V-11	B4-04	10-pg							BUCHAUS	THE PARTY OF THE	28.00   Time :	Date:	Date :	ory to return.
Sample	Type	21.A.W	5741/V	STUL	SIHIA							18/1	2				WHITE COPY : Laboratory to return.
	if Can. used				. *	-						P.P.D.IGWIN'T	1/x 1814	Company:	Company:	Company:	WHITE C
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Ű	Date	5/23	5/24	5/24	$\mathfrak{J}_{\mathcal{E}}$	- D-1	4					Results	1.0.4	Relingu Ž	Relinquished by	Relinqui	

### APPENDIX E

Comparison of TPE vs Pump and Treat

### RADIAN

### **CALCULATION SHEET**

CALC. NO.	BG -	04
CALC. NO.		

SIGNATURE BILL BUCHANS DATE 25 JULY 96 CHECKED JLM DATE 7/25/96

PROJECT PREECA - ELLSWORTH AFB JOB NO. 612 001 31 39

SUBJECT PUMP & TREAT VS TPE SHEET 1 OF 1 SHEETS

COMPARISON OF TPE VERSUS GROUNDWATER PUMP & TREAT

TOTAL GALLONS REMOVED IN TEST = 19,466 GAL WATER.

AVERAGE CONTAMINANT CONCEMBATION IN WATER:

POST - TEST = 45 Mg/L POST - TEST = 36 Mg/L

From EW-Z

(15+36) /2 = 40.5 Ng/L

MASS CALCULATION:

19,466 GALLONS (8.34 LB /GAL)(40.5 Mg/L TCE) (10-9 L/Mg WATER)

= 0.00656 LB TCE

COMPARISON OF MASS REMOVED WITH TPE TO MASS REMOVED WITH P&T:

0,0159/0.00656 = 2,4 TIMES GREATER

WITH TPE

E-1